THE

ELEMENTS OF BOTANY,

STRUCTURAL, PHYSIOLOGICAL, & MEDICAL.

BEING

A SIXTH EDITION OF THE OUTLINE OF THE FIRST PRINCIPLES OF BOTANY.

WITH

A SKETCH OF THE ARTIFICIAL METHODS OF CLASSIFICATION,

AND

A Glossary of Technical Terms.

BY

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A NEW EDITION, WITH SOME CORRECTIONS.

LONDON:
BRADBURY & EVANS, 11, BOUVERIE STREET,
FLEET STREET.
MDCCCXLIX.

LONDON:
BRADBURY AND EVANS, PRINTERS, WHITEFRIARS.

PREFACE.

The favourable opinion entertained of this Work having enabled it to reach a fifth edition, the Author has taken advantage of the opportunity thus afforded him of bringing it completely up to the present state of Botanical knowledge, without, however, interfering with its original plan, by the introduction of doubtful or merely speculative matter, or of questions which do not interest a student. It was in the outset a book for learners; its purpose was to state plainly and concisely the great facts of the science, and to separate them from the ulterior questions to which they lead; and, however much the work may have become extended by the addition of Explanatory Notes, the latter have never been permitted to appear in a form likely to divert attention from the main points. On the contrary, they have been printed in a different type, which renders them immediately distinguishable, and enables the reader to go through the principal propositions without, in the first instance, occupying his thoughts with their detailed explanation.

The Author's experience teaches him that this is, in fact, the best course for the student to pursue. The student is thus able to

acquire a more distinct perception of the great facts upon which the science essentially depends, and to which all other considerations are subordinate. Having once made himself acquainted with them, he can then turn to the evidence and explanatory matter with far more advantage than if he commences by their examination. Nothing tends so much to perplex a student as a cloud of facts which he cannot condense, and amidst which it is impossible for him to distinguish the true relation which the one bears to the other, or their respective importance. The purpose of this little book has been from the beginning to enable him to overcome this difficulty,—to look upon a clear well-defined outline, presenting no more shadow than is required to throw what is prominent into relief, and what is distant into its due place in the background,—metaphor apart, to learn exactly, and to generalize correctly.

The book is for learners, and not for proficients; the Author regards it in no other light, and puts it forth with no higher pretensions. It is for those who, having already mastered the *rudiments* as taught in the "School Botany," desire to advance another and a greater step, and to add to their incipient knowledge of the forms of plants an acquaintance with their structure and economy. He believes that it is necessary for all persons who would study Botany as a science, to acquire that kind of preliminary information which these Elements convey; and he would even venture to add that, in the absence of such knowledge, no one can by any possibility make satisfactory progress.

The true purpose of the work being thus explained, the reason why many things have been omitted will become obvious—they are of no importance to students. This is the case with minute anatomy, which cannot be prosecuted far in a Botanical course, and which,

however interesting and important it may be, has no obvious bearing upon Vegetable Physiology, when carried beyond what is taught in the following pages. The theory of Spiral Structure, which is wholly omitted, does not affect any question which students are interested about; in like manner, the obscure and disputed phenomena of Vegetable Fertilization, of Irritability and other vital actions, of the little modifications discoverable among seeds and fruits, the structure of Cryptogams, belong to a class of facts which can only be dealt with by those who have advanced beyond the state of pupilage. To the latter may be recommended the Introductions to Botany which are named in another page, among which a vast quantity of Botanical details will be found collected.

In the last edition the Author introduced an abridged account of the modes of classification adopted among Botanists, and of the medical properties of plants. These being now treated of partly in "School Botany," and very fully in the "Vegetable Kingdom," it has been deemed unnecessary again to include them, with the exception of the two artificial arrangements, the Linnæan and Analytical. In their place is given a Glossary of the technical terms generally employed among Botanical writers, and a very considerable addition to the Wood-cuts formerly employed.

University College, London,
January, 1849.

A LIST OF

INTRODUCTIONS TO BOTANY,

ANY OF WHICH THE STUDENT MAY ADVANTAGEOUSLY CONSULT WHEN HE HAS MASTERED THESE ELEMENTS.

BISCHOFF.—*Handbuch der Botanischen Terminologie und Systemkunde.* Von G. W. Bischoff. 3 vols. 4to. 1830–44. 87 lith. plates, containing 3911 figures. pp. 1609.

DE CANDOLLE.—*Physiologie Végétale; ou, Exposition des Forces et des Fonctions vitaux des Végétaux.* Par Aug. Pyr. De Candolle. 8vo. Paris, 1832. pp. 1579.

DE CANDOLLE.—*Organographie Végétale; ou, Description raisonnée des Organes des Plantes.* Par Aug. Pyr. De Candolle. 2 vols. 8vo. Paris, 1827. 60 copper-plates. pp. 862.

DE CANDOLLE.—*Théorie élémentaire de la Botanique; ou, Exposition de la Classification naturelle, et de l'Art de décrire et d'étudier les Végétaux.* Par Aug. Pyr. De Candolle. 3rd edition, published by his Son. 8vo. Paris, 1844. pp. 468.

ENDLICHER.—*Grundzüge der Botanik.* Von S. Endlicher und F. Unger. 8vo. Vienna, 1843. 449 wood-cuts, 1 map. pp. 494.

HENFREY.—*Outlines of Structural and Physiological Botany.* By Arthur Henfrey, F.L.S. 12mo. London, 1846–7. 18 plates of analysis. pp. 271.

ST. HILAIRE.—*Leçons de Botanique, comprenant principalement la Morphologie Végétale.* Par Auguste de St. Hilaire. 8vo. Paris, 1840. 24 copper-plates. pp. 930.

JUSSIEU.—*Cours élémentaire d'Histoire Naturelle: Botanique.* Par Adrien de Jussieu. 12mo. Paris, no date. 736 wood-cuts. pp. 616. This work is officially directed to be used in the Royal Colleges of France.

LINK.—*Elementa Philosophiæ Botanicæ.* Auct. H. F. Link, Ph. & M.D. 2nd edition, 2 vols. 8vo. Berlin, 1837. 4 lith. plates. pp. 878.

LINDLEY.—*An Introduction to Botany.* By John Lindley. 3rd edition. 8vo. London, 1839. Six copper-plates, and numerous wood-cuts. pp. 594.

LINDLEY.—*The Theory of Horticulture; or, an Attempt to explain the principal Operations of Gardening* upon Physiological principles. By John Lindley. 8vo. London, 1840. A few wood-cuts. pp. 387. This is an application of Vegetable Physiology to practical purposes.

MOQUIN-TANDON.—*Elémens de Tératologie Végétale.* Par A. Moquin-Tandon, M.D. 8vo. Paris, 1841. pp. 403.

RICHARD.—*Nouveaux Eléments de Botanique.* Par Achille Richard, D.M.P. 8vo. Paris, 1846. 7th edition. About 900 wood-cuts. pp. 851. This work is adopted by the French Royal Council of Public Education.

SCHLEIDEN.—*Grundzüge der Wissenschaftlichen Botanik, nebst einer methodologischer Einleitung.* Von M. J. Schleiden, M.D. 2nd edition, 2 vols. 8vo. Leipsig, 1845. 232 wood-cuts, 5 copper-plates. pp. 943.

UNGER.—*Grundzüge dèr Anatomie und Physiologie der Pflanzen.* Von F. Unger, M.D. 8vo. Vienna, 1846. 77 wood-cuts. pp. 131.

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* This is in the press, and will appear in the course of the spring.

THE

ELEMENTS OF BOTANY.

I.—GENERAL ATTRIBUTES.

1. PLANTS are scarcely separable from animals by any absolute character; the simplest individuals of either kingdom being often undistinguishable by our senses.

2. Animals are for the most part incapable of multiplying by mechanical or spontaneous division of their trunk, and are supported by nutritious matter, carried into their system from an internal bag or stomach.

3. Plants are for the most part congeries of individuals, multiplying by spontaneous or artificial division of their trunk or axis, and supported by nutritious matter conveyed into their system by (the absorption of their lower extremities or roots, or by) their outer surface.

4. Generally speaking, they are fixed to some substance, from which they grow, are destitute of locomotion, are enabled to digest their food by the action of light upon their skin, and form starch at some period of their lives. Animals, on the contrary, seem never to form starch.

5. Like the simplest animals, the simplest plants are vesicles, or vesicular threads; and the most complex plants may be regarded as indefinite multiples of such vesicles arranged in definite forms.

6. They are composed of TISSUE, out of which the elementary organs are constructed.

7. When first formed, tissue consists of a substance called *cellulose*, chemically composed of C_{24} H_{20} O_{10} *; but its chemical nature is rapidly altered by the addition of azotized and other matters, and especially by an increase in the relative proportion of carbon.

8. It is a hygrometrical substance, possessing adhesiveness, elasticity, extensibility, irritability, and vitality.

9. Its *adhesiveness* enables the elementary organs to grow together readily when in contact.

10. Its *elasticity* permits it to bend and recover, or to stretch and contract itself; the former a property essential to plants in consequence of their exposure to atmospheric disturbances, from which their want of locomotion prevents their escape; the latter demanded by the emptying and

filling processes, which are incessantly in action in the elementary organs while growing.

11. Its *extensibility* enables it to enlarge as new matter is added to it, and to receive the fluids or gases absorbed from without.

12. Its *irritability* renders it susceptible of the influence of light, heat, and similar external forces.

13. Its *hygrometrical* quality causes it to absorb water greedily when presented to it,—an essential condition of vegetable life.

14. Its *vitality* keeps all these qualities in play, enables plants to digest and assimilate their food, and their various organs to perform their manifold functions.

Nothing can more strongly mark the ignorance which some modern chemists betray of the facts of vegetable life than their denial of vitality, and reference of every phenomenon to chemical action. If they are right, the motions of fluids, the construction of tissues, the decomposition of matter and its combination in new forms, with the thousand other circumstances of vegetable growth, should go on as well in brute as in organized matter, provided the chemical proportions are maintained.

15. Its various forms are held together by an organic mucus, out of which the tissue itself is generated. This mucus has received the name of *intercellular substance*, and also of *cambium* when it is exuded by the parts of an already organized plant.

An objection may be taken chemically to this view, but it seems to be physiologically correct.

16. Tissue occurs in the form of the *cellular*, the *woody*, the *vascular*, the *pitted*, and the *laticiferous*, the different modifications of which constitute the ELEMENTARY ORGANS.

II.—OF THE ELEMENTARY ORGANS.

(*a*) *Their Structure.*

17. CELLULAR TISSUE (Pulp and Parenchyma, *of old writers;* Zellengewebe, *Germ.*) is the only elementary organ universally found in plants; the other forms are often either partially or entirely wanting.

18. Cellular tissue is composed of vesicles, the sides of which are not originally perforated by visible pores.

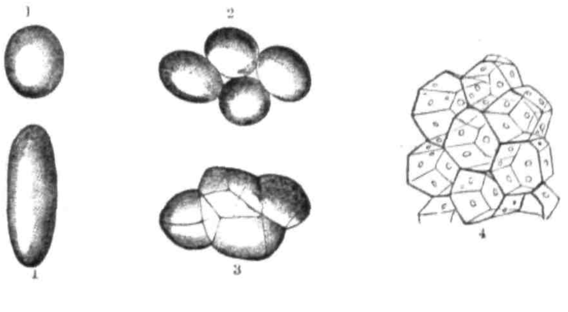
But holes are sometimes found in the sides of cells, as in Sphagnum. In such cases they are formed at a late period of the growth of the cell; but the cause of their appearance is unknown.

19. Each vesicle is a distinct individual, cohering with the vesicle with which it is in contact.

20. Therefore the apparently simple membrane which divides two contiguous cells is in fact double.

21. If the adhesion of the contiguous cells be imperfect, spaces will exist between them. Such spaces are called *intercellular passages.*

22. The vesicles of cellular tissue, when separate, are round or oblong;[1] when slightly and equally pressed together,[2] they acquire a dodecahedral appearance,[3] [4] with a hexagonal section; stretched lengthwise they become prismatical, cylindrical, fusiform, &c.



23. When cellular tissue is composed of vesicles fitting together by their plane faces, it is called in general terms *parenchyma;* and *prosenchyma* if the vesicles are fusiform. Both these are sometimes branched, and their divisions inosculate.

Spheroidal cellular tissue is *merenchyma*[2], or *sphærenchyma;* conical, *conenchyma*[5]; oval, *ovenchyma*[6]; fusiform, *atractenchyma;* cylindrical, *cylindrenchyma*[8]; sinuous, *colpenchyma*[9]; branched, *cladenchyma*[10]; prismatical, *prismenchyma*, which, when compressed, becomes *muriform*[7]; stellate, *actinenchyma*[12]; entangled, branched and tubular, *dædalenchyma*[11].

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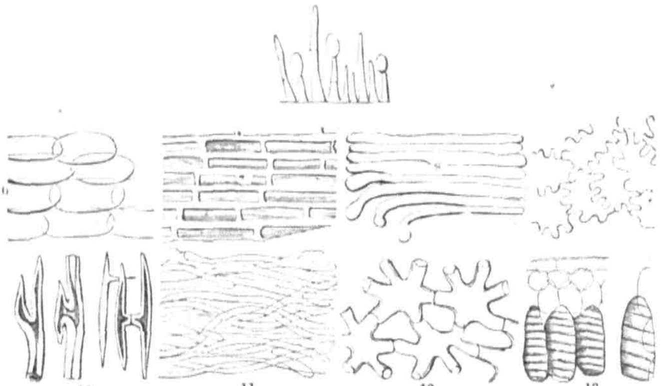

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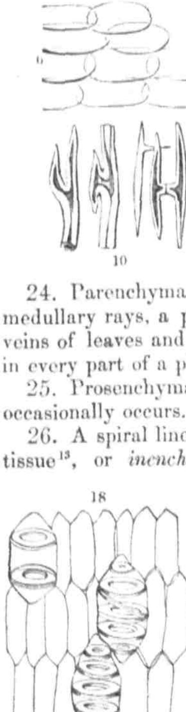
24. Parenchyma constitutes all the pulpy parts ; the medulla or pith, the medullary rays, a portion of the bark, and all that intervenes between the veins of leaves and other appendages of the axis. Consequently it occurs in every part of a plant, and especially in those which are succulent.

25. Prosenchyma is confined to the bark and wood, in which it only occasionally occurs.

26. A spiral line is often found in the inside of a cell, when *fibro-cellular* tissue[13], or *inenchyma* is produced. It sometimes happens that the membrane connecting such fibres is absorbed, leaving the fibres only to constitute the cell, as in the lining of the anther ; or the spires cease to be continuous, and break up into rings[18 20] or bars[19].

18



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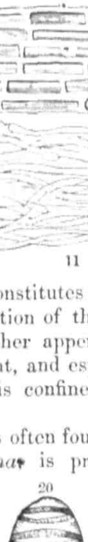

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27. This fibrous appearance is extremely common in tissue, and by some is believed to be universal. It is, however, easily overlooked, because it often is evident only while tissue is wet. This has been more especially demonstrated by Schleiden in the hairs of the cephalium of Melocactus[14].

14

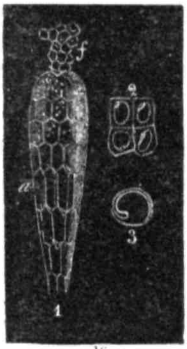
15

28. Occasionally, too, cells have their sides marked with minute transparent dots, which are regarded as being analogous to the spires of the fibro-cellular tissue[15].

29. The spiral thread either adheres to the side of the cell ; or is free, as in some kinds of hair. In the latter case it forms the so-called *spermatic animalcules* of the antheridia of mosses, &c.,[16] in which cases its elasticity and hygrometrical properties give it the appearance of spontaneous motion.

The terminal enlargement found in such fibres is probably a free nucleolus (62) as Nägeli has suggested ; and it may likewise be assumed with him, in the absence of evidence to the contrary, that motile threads, or vibratory ciliæ, found on the spores of some Algals[17], are of an analogous nature, the spore being a nucleolus.

30. The function of the cellular tissue is to transmit fluids in all directions; the membrane of which it is composed is therefore permeable,



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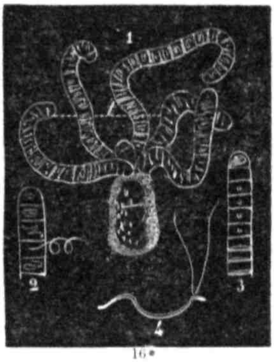

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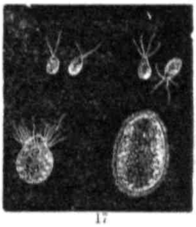
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although not in general furnished with visible pores (18). When it is thickened by the deposition of the protoplasm (68) or sclerogen, passages are left in the latter, communicating with the sides of the tissue, and giving it the appearance of being dotted or pitted (31).

31. Pitted Tissue (*Bothrenchyma*) is a modification of the cellular, either consisting of short cylindrical cells placed end to end,[21] [22] opening into each other, and forming continuous tubes; or of long tubular cells [23] [40].

21

22

23

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26

Its sides are marked by pits, resembling dots, produced in consequence of the protoplasm being unequally deposited over the inside of the cells.

Fig. 16.—1. Antheridium of a moss; 2. four of its cells, each containing a spiral thread; 3. a spiral thread separate.—A. D. J.

Fig. 16*.—1. Portion of the contents of the antheridium of Chara. Several jointed tubes *t* attached to a vesicle; 2. the end of one of the tubes in which lie the spiral threads, one escaping; 3. end of a tube which has already lost its spirals except the last cell; 4. the spiral and its ciliæ free, as seen in water.—A. D. J.

Fig. 17.—The spores of Algals, with their motile ciliæ.

It is common in wood, of which it forms what is vulgarly called the porosity. Its office is to convey fluids with rapidity in the direction of the woody tissue that surrounds it. Formerly it was considered a form of vascular tissue, and called *dotted ducts*, or *vasiform tissue*

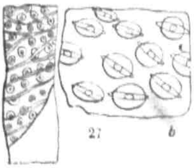
32. WOODY TISSUE (*Pleurenchyma*) consists of elongated tubes tapering to each end, [25, 26] and, like the vesicles of cellular tissue, imperforate to the eye. It may be considered a form of the cellular tissue itself, to which it is frequently referred; but it is practically distinguished by its cylindrical form, great length, extreme fineness, and toughness; the latter of which properties is produced by the thickness of its sides.

It is sometimes regarded as prosenchyma, and so called: but that term is better limited to short fusiform cellular tissue.

33. It is found in the wood, among the parenchyma of the liber, and in the veins of the leaves or other appendages of the axis.

34. Its functions are to give strength to the vegetable fabric, and to serve as a medium for the passage of fluid from the lower to the upper extremities.

35. Common Pleurenchyma has its sides destitute of definite markings; the glandular[29, 44] is a variety in which the sides of the tubes are furnished with circular disks; the latter occur chiefly in Coniferous plants and such as have aromatic secretions. These discoid appearances are caused by the application to each other of tubes, whose sides are marked externally



27 b a

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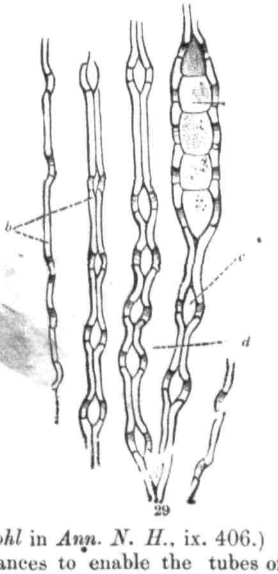

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with depressions resembling a watch-glass.[28] Such depressions are accurately adapted to each other, and so form a circular double convex space between the sides of the tubes.[24, 29] The centre of these spaces is the thinnest, and has a canal running into it, and therefore allows light to pass the most freely through it, whence arises the appearance of one circle within another. In some cases the disks intervene between threads of an irregular spire [27 a], and in others they are widened in the form of fissures.[27 b]—(*Mohl* in *Ann. N. H.*, ix. 406.)

24

36. These disks are thought to be contrivances to enable the tubes of pleurenchyma to discharge their contents from one to the other, or into the intercellular spaces.

Fig. 29.—A diagram representing the appearance of common glandular pleurenchyma; 28, shows the appearance of a tube seen externally, with the discoid depressions on its surface; *b c d* bound a thin section of such glandular wood: *b* representing the sides of two tubes in contact; *c* one of the lenticular cavities between the tubes; *d* the hollow of a tube.

37. VASCULAR TISSUE (*Trachenchyma*) consists of very thin-sided cylinders *tapering to each end, and having a fibre or fibres spirally generated in* their inside.

It has been asserted by Count de Tristan that the fibre is external to the tube; but independently of the plainest evidence to the contrary in recent plants, I have received from Mr. Quekett a specimen of the interior of a spiral vessel, from a fossil palm tree, modelled in silica, which completely sets at rest the question as to which side of the membrane produces the spiral fibre.

38. Of this kind of tissue *spiral vessels*[30 40 41] are the type. Their fibre is of a highly elastic nature, and is capable of unrolling when stretched.[31 32]

39. They overlap at their ends, where they adhere,[30] the thin external membrane being absorbed; and thus they communicate freely with each other through intervals between the turns of the spiral fibre, which at that part do not touch.

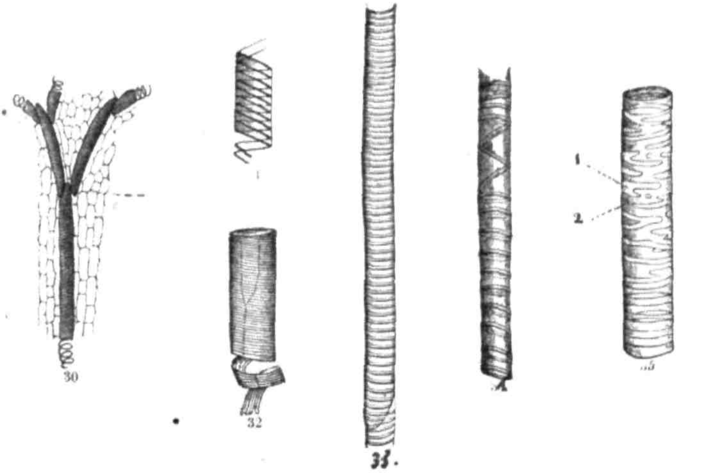
40. Spiral vessels are found in the medullary sheath, and in all parts that emanate from it, especially the veins of the leaves, and everything that is a *modification of them.*

41. They are usually absent from the wood and bark. They, however, occur in these and other unusual parts in a few rare cases; as in the wood, and bark, and pith of Nepenthes.

42. The spiral vessels appear intended for the conveyance of air, which has been found to contain 7 or 8 per cent. more oxygen than the atmosphere.

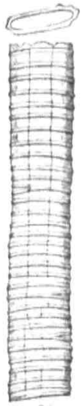
43. The spiral fibre seems provided as a special guard against the introduction of water into the cavity of the spiral vessel.

44. *Ducts*[33] are transparent tubes, the sides of which are marked with rings, bars, or transverse streaks.



45. They are slight modifications of the spiral vessel, differing principally in being incapable of unrolling; and, in some cases, in the turns of the spiral fibre being distant[34] or broken,[35 36] or even, in appearance, branched.[38]

46. In those cases where the turns of the spire actually touch each other, the ducts, which are then called *closed*, can only be distinguished from spiral vessels by their inability to unroll ; while at rest they appear to be absolutely the same.



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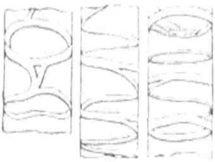

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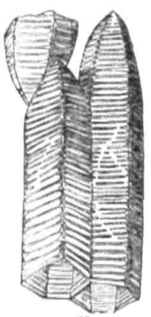

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Ducts are closed[33, 45] when the spires touch each other ; annular, when they seem to consist of separate rings[36, 42] ; reticulated, when the spires cross each other[41] ; scalariform, when the lines upon their sides are horizontal and equidistant[37] ; broken, when the spires separate[35, 38] very irregularly, fork, and anastomose.

47. Ducts occur among the woody tissue of herbaceous plants ; are abundant in the wood of the higher tribes of cellular plants, such as Ferns and Lycopods ; and their ends are often in immediate connection with the loose cellular tissue occupying the extremities of the roots.

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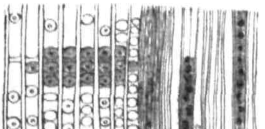

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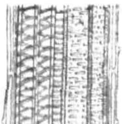

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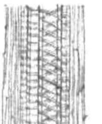

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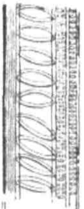

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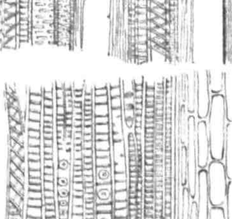

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48. Their functions have not been accurately determined. They certainly convey fluids, when they are not closed. In some, if not all cases, they are probably spiral vessels whose membranous tube has grown faster than

the spire, in which case the aëriferous function ceases, and they are converted to the purpose of sap-vessels.

49. LATICIFEROUS TISSUE [43, 46, 47] (*Cinenchyma*) consists of uninterrupted anastomosing tubes, having thick unmarked sides of considerable and very unequal thickness. It forms the *proper vessels* of old writers.

50. Its tubes have been thought to have a structure quite peculiar, the ramifications opening freely into each other, and the sides of the tubes presenting no appearance of articulation. But, as it eventually breaks up into short joints in the fruit of the Musa, it is probably originally constructed of short cells placed in long rows.

51. It commonly occurs in the liber of Exogens, especially in the root, whence the ramifications proceed to the surface of other organs.

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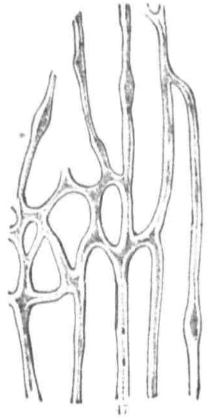

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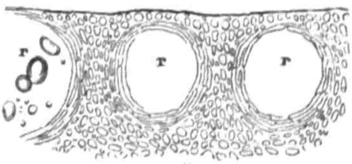
There seems, however, to be no foundation for the supposition that the currents seen in hairs are connected with laticiferous tissue, as was once supposed.

52. Laticiferous tissue conveys *latex*, a peculiar fluid, usually turbid, and coloured red, white, or yellow; often, however, colourless.

53. The use of this tissue is unknown. It is said to carry the latex to all the newly-formed organs, which are by some supposed to be nourished by it.

54. There are no other elementary forms of tissue. *Air-vessels*, *Cysts*, *Turpentine vessels*, *Reservoirs of oil*, are all either distended intercellular passages, or cavities built up with cellular tissue,[48] or large cells filled with peculiar secretions.



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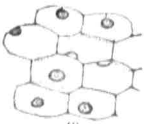
55. When such cavities are essential to the existence of a species, they are formed by a regular arrangement of cellular tissue in a definite and unvarying figure; *Ex.* Water-plants. When they are not essential to the existence of a species, they are mere irregular distensions or lacerations of the tissue; *Ex.* Pith of the Walnut-tree and hollows in the stems of Grasses, Umbellifers, &c.

Fig. 48.—A section of the rind of an orange, showing the cysts *r*.

(b) Their Development.

56. The manner in which the elementary organs are developed is at present uncertain.* It is, however, apparently proved that they are distinct from each other when completely formed, although in a state of union; and it is certain that they are separable. The cells, moreover, have generally on their sides, when full grown, a thickened circular disk, called a cytoblast or nucleus.[49] The principal opinions that have been promulgated are the following:—



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57. *Cells are produced by gaseous matter extricated among mucus.*

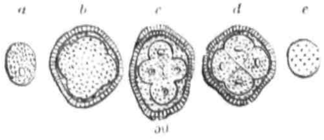
This is not now insisted upon, partly because it is thought that the double walls which separate cells are irreconcileable with such an origin. It must, however, be apparent to any one who will examine the cells formed, when carbonic acid is extricated among viscid fluid, that in such a case each cell or vesicle has its own separate sides.

58. New cells are produced by old cells on their outside, as new branches are produced by old ones.

This opinion has been proved from the growth of certain Algals, and especially of Marchantia among Liverworts.

59. New cells are formed in consequence of the internal subdivision of an old cell, by a fold, or plait, or septum, projecting into its cavity.

This, which is called *merismatic* or fissiparous development, has been thought to occur in some Algals more especially, and in the cells which generate pollen-grains. This is shown by Unger, who considers it universal, in the accompanying cut, which purports to represent the progressive division of a parent cell[50] a



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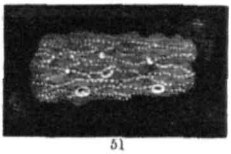

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into four, in the production of the pollen-grains[50] e of Malva sylvestris. Mr. Thwaites's observations upon the formation of the spore in Vesiculifera seem to support this view.—(See *Ann. N. H.*, xvii. 334.)

60. Cells are produced by a stricture of the sides of an original cell, which stricture eventually divides the latter into two cavities, just as happens with a rocket-case, when it is "choked" or bound round by a ligature.

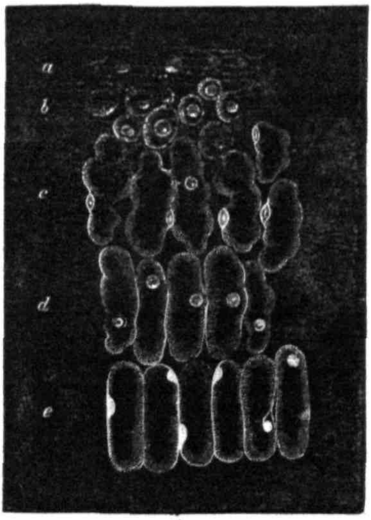
* The reader who has never investigated this subject for himself, and who is unacquainted with its difficulties, may be surprised at this statement; but I can come to no other conclusion. In fact, the uncertainty of the facts to which evidence points, and the enormous obstacles that exist in determining what are facts and not deceptive appearances, are sufficiently shown by the conflicting opinions entertained by the most accomplished observers. When men like Mirbel, Mohl, Schleiden, and Nägeli, are directly opposed to each other, although their lives have been largely devoted to the pursuit of the inquiry, the prudent man will pause before he forms his opinion. In this place, the briefest possible explanation of the prevailing views is all that it is considered expedient to bring forward. Those who would study the subject for themselves should at least provide themselves with the numerous writings of the above-named naturalists, as well as with those of Unger, Thwaites, and others, and especially with the capital papers on cell-formation, by Nägeli, translated for the Ray Society, and by Mr. Thwaites in the Annals of Natural History.

Fig. 51.—Vegetable mucus, molecular matter, nuclei of cytoblasts, and cytoblasts themselves.—Schleiden.

Of this opinion are Mohl and Mr. Henfrey ; and the latter urges in support of it the maintenance of the continuity of the cavities of the two utricles where the constriction is imperfect, but where the deposition of the septum can distinctly be perceived at the circumference.

61. Schleiden refers the origin of a cell to the formation among mucus[51] of a *cytoblast*,[52 a] or central point, which acts chemically upon the matter in contact with it, until it forms a firm layer. This layer is a closed bladder[52 b] or vesicle, which enlarges in size by assimilating the fluid, and becomes the cell,[52 c d e] to whose inside wall the cytoblast, which does not grow so much, remains attached in the form of a circular space or disk.

Mohl is, however, of opinion, that the cytoblast is never in the beginning immediately applied to the cell-wall, but that it is invariably supported by mucous threads, which radiate from it, and suspend it near the centre of the cell-cavity.[53 54] *Its attachment to the cell-wall is a secondary state.* The cells arrange themselves in a *definite manner as they grow*, and so form solid masses[52] or threads.[54]



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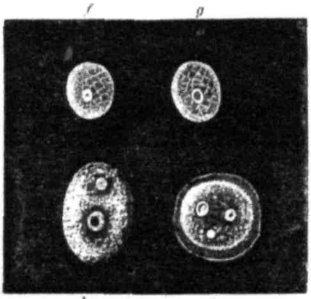

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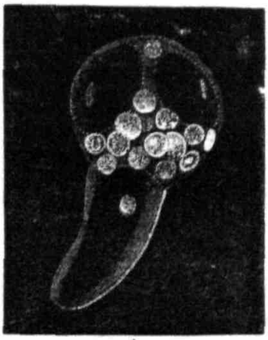

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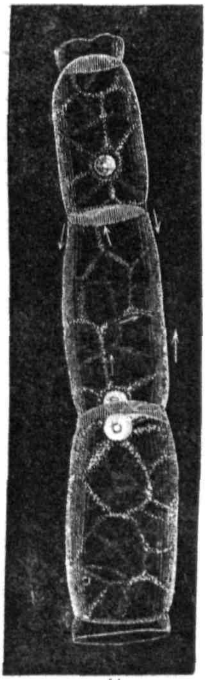
Fig. 52.—Cells from the albumen of Chamædorea Schiedieana; *a* the youngest part, consisting of gum, nuclei, and cytoblasts; *b* older cells; *c d e* still older, as seen in distilled water, all the latter with cytoblasts adhering to their sides.—*Schleiden.*

Fig. 53.—*ee* a cell from the leaf of Crassula portulaca, containing five other cells; *f g h* cytoblasts of different ages, the latter with two nucleoli; *i* a cytoblast with the cell forming round it; *k* formation of cells in the germination of a spore of Marchantia.—*Schleiden.*

62. Cells proceed from nucleal vesicles, or nuclei, inclosing dense mucilage with one nucleolus or more. These nucleoli are probably also vesicles of a second order, filled with mucilage. The nucleal vesicles, which may be free or attached to the walls of a cell, send out many thread-like currents of sap into the cavity of the cell, and thus become foci of vitality, by whose action the walls of the cell are formed and nourished.

This seems to be a brief exposition of Nägeli's views. He regards the nucleus as a universal phenomenon in all vegetable cells, and he must therefore be taken to be an advocate of the doctrine of each cell having the power of forming other cells within its cavity. His views are elaborately explained in his paper on cell-formation above referred to. See also Mr. Henfrey's *Outlines*, Part I.



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63. The cells are formed by cytoblasts generated amidst mucus or protoplasm, by the action of the cytoblast and certain electrical currents connected with it, of which forces the cytoblast is the centre[54]. The electrical currents are caused by chemical changes arising from the vital processes which go on amongst the endochrome, or contents of the cell.

This is the view taken of the matter by Mr. Thwaites, whose paper on Cell-membrane (*Ann. N. H.*, xviii. 15) is the best on that subject which has appeared in this country. He regards the original wall of the cell as a mere shell, having quite a subordinate office to perform in the growth of plants, and he ascribes all the vital powers of growth to the cytoblast and colouring matter contained within the cell. He supposes the cell-membrane to arise from the action of electrical currents upon mucus, and that fissiparous or merismatic division (59) is caused by the presence of two centres of electrical force, each giving rise to a set of currents, and producing two cell-membranes instead of the original one.

64. These opinions may, upon the whole, be regarded as justifying the conclusion that cells are produced in mucus by the action of vital force; that they are nourished by cytoblasts or centres of vitality connected with their circumference by mucous threads: that their external skin possesses little vitality, is analogous to cuticle, and chiefly serves as a guard to their contents; and that they are multiplied by the production in their interior of new centres of vitality, which either remain inclosed within them, or escape through their sides.

Fissiparous division, as it is called, seems to be not irreconcilable with this view, as it may be really caused by the gradual formation of two or more cells in one parent cell, which formation only becomes apparent when the sides of the new cells come in contact.

65. Tubular tissues appear to be modifications of the cellular, deriving their form either from nutrition being conveyed to them exclusively in particular directions, or from their being produced in parts rapidly undergoing extension in the course of early growth.

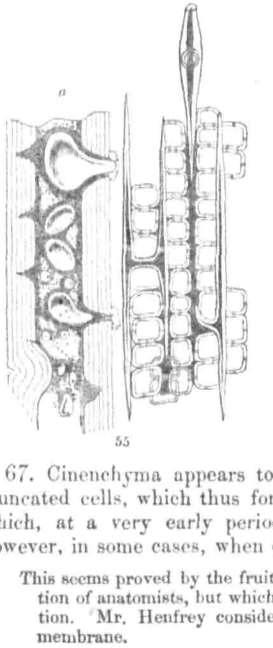
Fig. 54.—Three cells of the hair of a potato, with their cytoblasts, and the mucous threads proceeding from them. The arrows indicate the directions of the currents, which Mr. Thwaites regards as resulting from electrical agency.—*Schleiden*.

According to Mohl, the velocity of such currents is about 1-500th of a French line per second.

An observation by Schleiden of young cells forming in large numbers in the interior of the woody tubes of Monstera pertusum,[55 a] and piercing the sides of those tubes by way of the pits which exist there, would seem to show conclusively the origin of tubes, especially if the branched pleurenchyma of the Mangrove[55 b] is really produced by such a process as Schleiden seems to suppose.

66. *Spiral threads are secondary deposits formed on the inside of certain* tubes, and in some cases appear to owe their origin to gum, derived from the transformation of starch.

This opinion is formed upon the observations of Schleiden, who found the young cells on the ovule of Collomia filled with starch[56 d]; the older cells chiefly containing gum[56 e] assuming a spiral direction; and the complete cells consisting of free elastic spiral fibre only.[56 c]



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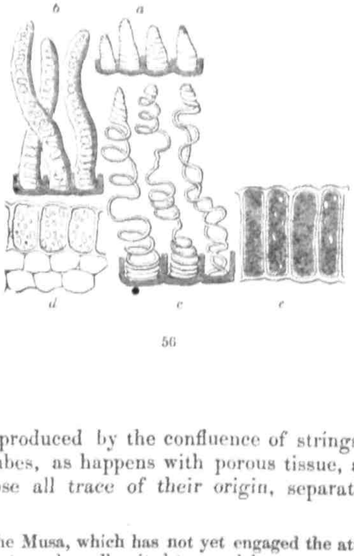

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67. Cinenchyma appears to be produced by the confluence of strings of truncated cells, which thus form tubes, as happens with porous tissue, and which, at a very early period, lose all *trace of their origin*, separating however, in some cases, when old.

This seems proved by the fruit of the Musa, which has not yet engaged the attention of anatomists, but which is extremely well suited to an elaborate examination. Mr. Henfrey considers them intercellular passages, lined by a proper membrane.

(c) *Their Contents.*

68. When the unazotised shell of the cell is formed, (18) it is immediately lined by a sedimentary matter called the PROTOPLASM [57 a b].

This Mohl calls the primordial utricle. When young, it shrinks up upon the application of weak tincture of iodine, leaves the cell-wall, and forms an interior bag. Afterwards it becomes inseparable. Iodine stains it brown. It is not deposited *in uniform layers, but depressions are left on its sides, which form passages* intended to enable the cells to communicate with each other, notwithstanding the thickening of their sides. These passages are so placed that they exactly answer to each other in contiguous cells [57 d d]. They cause the dotted or pitted appearance [57 *] so common in tissues.

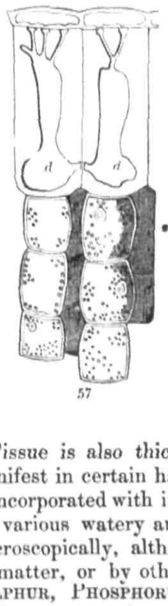
Fig. 56.—*a* Hairs on the skin of the fruit of Salvia verticillata; *b* of S. Horminum; *c* of S. Spielmanni; *d* young cells on the ovule of Collomia; *e* half ripe cells of the same, containing gum.

69. In the centre is the cytoblast connected with the protoplasm by means of threads or plates.

Mohl says, that in Rhamnus Frangula fruit, these filaments possess such firmness that they can be cut through horizontally with a sharp knife, and nevertheless retain their position.

70. These bodies all contain nitrogen, and it is probable that they are the seat of protein. When the cells become old they disappear, and this may be regarded as the explanation of the general deficiency of nitrogen in old tissues.

71. Tissue is further altered by the addition of layers of a substance called SCLEROGEN, to which wood and the bony parts of plants owe their hardness ([58 a b], and also [55 a].) This consists of $C_{35} H_{24} O_{10}$ (*Payen*), and therefore would seem to owe its peculiar condition to an excess of carbon. It may be dissolved out by hot nitric acid.



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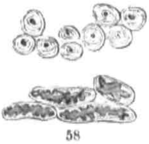

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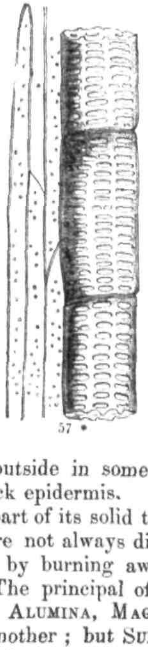

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72. Tissue is also thickened by addition to its outside in some cases, as is manifest in certain hairs, and in the cells of thick epidermis.

73. Incorporated with its molecules, and forming part of its solid texture, are also various watery and other matters, which are not always discoverable microscopically, although they may be found by burning away the organic matter, or by other chemical appliances. The principal of these are SULPHUR, PHOSPHORUS, POTASH, SODA, LIME, ALUMINA, MAGNESIA, SILICA, IRON ; some found in one species, some in another ; but SULPHUR, PHOSPHORUS, POTASH and SODA, are perhaps universal.

Plants also contain in their tissues occasionally, chlorine, iodine, bromine, copper, and manganese.

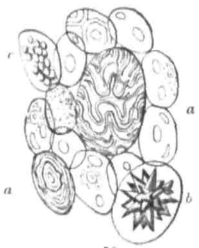
74. A matter called AMYLOID has been distinguished by Schleiden as a component of some tissues: "cartilaginous while dry, gelatinous when moist ; soluble in boiling water, strong acids, or alkalies ; insoluble in ether or

---

Fig. 57.—A section of the leaf of Mammillaria rhodantha; *a* epidermis ; *b* the cellular layer beneath it, in which a large quantity of protoplasm has been deposited, leaving passages open ; *d d* cavity of these cells ; *c* ordinary parenchyma.—*Schleiden*.

alcohol; when moderately firm, it is coloured blue by iodine, losing this colour and becoming yellow by soaking in water."—*Henfrey.*

75. JELLY, (Pflanzengallerte—*Schleiden.*) A mucilage which is horny and homogeneous when dry, slowly soluble in water, unaffected by iodine: occasionally fills particular cells, as in the stems of certain cacti [59 a], when it gives the cells a singular crimveular appearance; and in the tubercles of Orchis and its allies, when it fills large angular cells with an apparently homogeneous mass, which, however, itself consists of nascent cells.



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It is the gelatinous matter of Carrageen moss and other Algals, a portion of horny albumen, salep, &c., and is probably the same as the Bassorin and Pectin of chemists. Its exact composition is unknown; that of Pectin is said to be $C_{12}\ H_{16}\ O_{10}$.—*Mulder.*

76. STARCH [60 61] is one of the most conspicuous of the cell contents. It occurs in all plants at some period of their existence, and forms the most positive mark of distinction between plants and animals that has been yet discovered.

77. When pure its composition is $C_{12}\ H_{20}\ O_{10}$, and it is stained blue or some shade of violet by iodine.

This is pronounced to be the true chemical composition of starch according to the latest researches of Berzelius and Liebig. Its discrepancy with former analyses appears, from the observations of Schleiden, to have been caused by the starch previously examined not having been freed from its impurities with sufficient care.

78. It never occurs perfectly pure in nature, the peculiar secretions of the species being incorporated with its surface.

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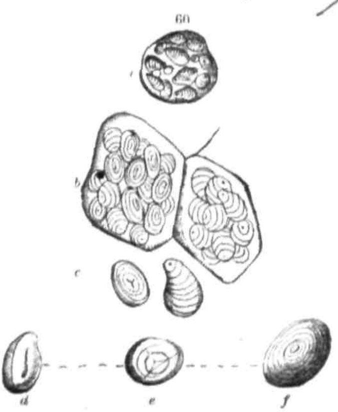


Hence, although chemists find the composition of pure starch to be uniform, natural starch varies in its value as diet, according to the quality of the plant that yields it, as is evident if the action on the stomach of potato starch from a poisonous Solanum, is compared with that of arrow-root, from the insipid inert Marants. Its usual impurities arise from the presence of fatty or albuminous matter.

79. It is insoluble in water, but it is readily changed into gum by natural processes, and it disappears under the action of caustic potash.

The observations of Schleiden show that although it forms a bulky mass when treated with water, yet it is incapable of passing through a cellular membrane.

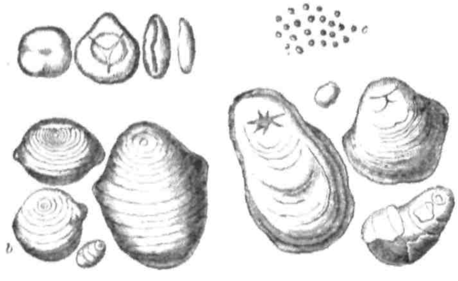
80. Starch-grains are found in all cellular parts when full grown, except in the epidermis. They do not occur in young parts, nor in intercellular passages, nor in vessels (which are not secreting organs). They are com-

Fig. 59.—Cellular tissue of Cereus variabilis, containing *a a* jelly; *b* crystals; *c* starch-grains.—*Schleiden.*

Fig. 60.—*a b* Cell of a potato containing starch; *c* starch-grains apart; *d e f* wheat starch in different positions.

paratively rare in parts near the light, and most abundant in undergroun or internal organs, as in roots, tubers, corms, bulbs, the pith of branches and the seeds.

81. Starch grains are extremely variable in size[61]; they usually present the appearance of concentric irregular circles, whichever way they are turned, when under the eye of the observer.



82. These lines represent layers, formed one after the other, and differing in density according to their different degrees of hydratation.—*Payen.*

83. On some part of the surface of a starch-grain is usually found a hole or irregular slit [61 a c d], which appears to be a rupture of the layers, caused by distension.

Payen produced it artificially by contraction through drying. It is not found in very young starch-grains. Nevertheless it has been thought to be a point of attachment, and called a hilum. It seems to be rather an aperture intended for the passage of fluid into the grain, and to be analogous to the pits in pitted tissue.

84. The formation of layers may be regarded as analogous to the changes produced on the walls of cells by the successive deposit of protoplasm (68) or sclerogen (71).

85. It seems probable that starch-grains are altered cytoblasts, hollowed and expanded, and changed in their chemical nature by vital force.

This is Karl Muller's opinion, (*Ann. N. H.*, xvii. 74,) and seems to be very much strengthened by the angular nature of some kinds of starch, as that of maize[62], which is exactly analogous to the appearance presented by the jelly nodules of salep, which are large bags filled with young cells or cytoblasts. The starch-grains cannot be produced by the sides of cells, as Turpin and others have imagined, because cells are filled to their very centre with them, and the central grains can have no contact with the sides. Mr. Quekett says that starch-grains originate sometimes on the outside and sometimes in the inside of a cytoblast.

62

86. They have a quasi-spontaneous motion in the fluid which bathes hem in their parent cells.

This is visible in the fovilla of pollen, in the interior of the spores of Conjugate Confervæ, and in the rhizome of Equisetum fluviatile, concerning which I find the following observations in my note-book :—" Oct. 4, 1838.—In the tubes near the base of the stem, oblong bodies scattered through the fluid, having a tremulous appearance, as if suspended in fluid. Here and there one or two observed swimming through the fluid, sometimes with rapidity, sometimes with apparent difficulty, as if struggling against *an opposing current.* Motion exactly like that of animalcules, with a slow movement. Seldom many moving at a time, but one will be active and all near it quiet ; then it ceases and another begins. Oct. 6. —Same motion observed in the rhizome, sometimes advancing, sometimes retreating, as if attracting and repelling each other. I watched two at the end of a cell ; their appearance was exactly that of two bodies striving to pass round it ; at last they disappeared. Then followed in their wake a large ovate body

($\frac{1}{1500}$ long) pointed end foremost ! Iodine stopped the motion, and coloured these bodies violet."

87. CHLOROPHYLL is the green granular colouring matter of plants. It is of a resinous nature, contains nitrogen, and very often envelops the grains of starch. It is formed under the action of light, and not otherwise. In the autumn it changes its colour to red or yellow. It is usually contained in cells lying below the surface.

The yellow of autumn is said to contain more wax than the green of summer, both in leaves and fruits. An incomplete analysis by Mulder, gives $C_{18}\ H_{18}\ N_2\ O_8$, with some nitrogenous matter not determined. Schleiden observes that the composition of the crude Indigo matter is very similar, viz., blue Indigo $C_{16}\ H_{10}\ N_2\ O_2$, and white Indigo $C_{16}\ H_{12}\ N_2\ O_2$.

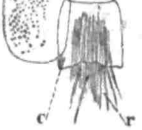
88. CHROMULE, or colouring matter not green, is also commonly present.

The distinction from Chlorophyll is ill understood, especially of that which is granular and insoluble in water. It is probable that many very different matters are included under this name. In some of them nitrogen is present. Alkalies change certain reds to blue, and acids certain blues to red. Some writers define Chromule to be fluid colouring matter, and Chlorophyll (87) to be granular colouring matter.

89. WAX, OIL, CAMPHOR, and RESINOUS matters are abundant in cells ; the former more especially in seeds.

Their usual chemical condition may be judged of from the following examples, as given by Sir R. Kane in his Elements of Chemistry :--

1. Oil of Marjoram	$C_{50}\ H_{40}$
2. Turpentine	$C_{20}\ H_{16}$
3. Camphor	$C_{20}\ H_{16}\ O_2$
4. Oil of Lavender	$C_{15}\ H_{14}\ O_2$
5. Oil of Mustard	$C_{32}\ H_{20}\ O_5$ ($N_4\ S_5$)
6. Asafœtida	$C_{40}\ H_{26}\ O_9$
7. Olein	$C_{94}\ H_{87}\ O_{15}$



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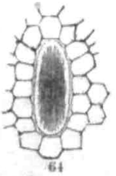

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90. CRYSTALS of various kinds are also present, and bear the name of *raphides*. They have usually an acicular [53] form, but are also cubical, prismatical, and conglomerate [59 b].

91. They are always formed in the interior of cells, and sometimes of cells much larger than others [64].

Payen says they are formed in a particular apparatus, which hangs down from the side of a cell, but I have not seen this, at present.

92. They are arranged with great regularity in the cells of some plants.

Mr. Quekett finds that in the testa of Ulmus campestris, "the sinuous boundaries of its compressed cells are completely traced out by minute rectangular crystals adhering to its walls ; and that in the subcuticular cells of the sepals of Geranium Robertianum, &c., every cell contains a cluster of radiating conglomerate raphides"

93. They are so abundant in some plants, that they exceed the weight of the tissue itself, even although undried.

In some cases the old stems of Cacti appear as if filled with sand, owing to the enormous quantities of these crystals that are present. Lucas finds 80 per cent. in Cereus senilis.

94. Acicular raphides are phosphate of lime (*Quekett*); conglomerate, an oxalate of lime (*Id.*). Others have a different composition.

Raphides are in fact crystals formed by the action of organic acids: phosphoric, oxalic, citric, tartaric, malic, &c., upon such bases as the fluids of plants may happen to contain. Right rhombic crystals are said to be carbonate of lime; octahedral crystals and six-sided prisms to be sulphate of lime.

95. Besides these, SUGAR, GUM, DEXTRINE, TANNIN, CAOUTCHOUC, and various ALKALOIDS form the contents of tissue.

Their chemical composition is said to be—

Sugar (Cane)	$C_{12}\ H_{10}\ O_{10} + H\,O_3$
—— (Grape)	$C_{12}\ H_{11}\ O_{11} + H\,O_3$
Gum	$C_{12}\ H_{11}\ O_{11}$
Dextrine	$C_{12}\ H_{10}\ O_{10}$
Tannin	$C_{18}\ H_5\ O_9 + H\,O_3$
Caoutchouc	A hydrocarbon of unknown composition.

Kane.

III.—OF THE EPIDERMIS AND ITS PROCESSES.

96. The surface of plants is covered by a skin called the EPIDERMIS, consisting of one or more layers of parenchyma, the cells of which are tabular or compressed, and in a firm state of cohesion[65].

97. The spaces seen upon the epidermis, when examined by a microscope, represent these cells.

This is not the less true, because in some kinds of epidermis the boundary of the cells is sinuous; for in such cases we may suppose the epidermis to be made up of cells with a very uneven surface[65 b].

98. It is, therefore, not a peculiar membrane, but a form of cellular tissue.

99. It is spread over all the parts of plants which are exposed to air, except the stigma.

100. It is not found upon parts habitually living under water.

101. It is itself protected by an extremely thin homogeneous pellicle, which covers every part except the openings through the stomates. This membrane is the *cuticle*, and may be regarded as a superficial secretion, of the same nature as the intercellular substance (15)[65 c 66].

Mohl, however, maintains that the cuticle is really nothing more than the thickened external sides of the epidermoidal cells, and that when it is separable, it is only because it can divide from the protoplasm or secondary lining. He, however, admits that these external cells grow outwardly after they have arrived at a certain stage of development, as is indeed manifest from the condition of such hairs as those of Crucifers, which gradually become quite tuberculated on their surface[67].

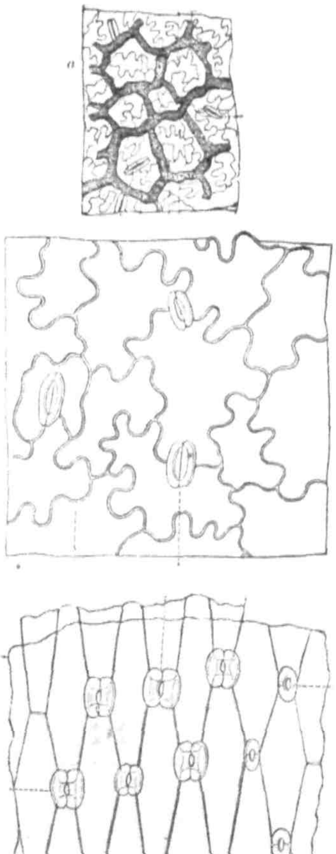

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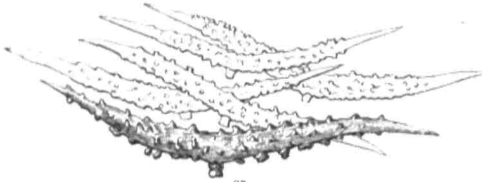
Fig. 65.—*a* Chambers formed beneath the stomates of the leaf of the Balsam, by a net-work of dark parenchymatous cells; *c* the epidermis of the Iris germanica, with its cuticle, the former with its stomates, the latter with its slits; *b* epidermis of Madder, with its stomates.

102. It is in some cases composed largely of silicate of potash; in other cases it is hardened by a deposit of calcareous matter.



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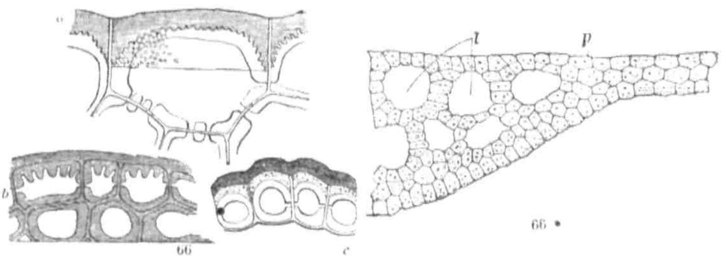
103. The use of the epidermis and cuticle is to guard the subjacent parenchyma from the immediate action of air, and so prevent its being dried up.

This seems to be proved conclusively by the thickness of the skin in plants exposed to great drought, its thinness in those which inhabit damp places, and its absence from parts which live under water [66 *]



104. The epidermis is furnished with stomates.

105. STOMATES are oval spaces lying between the sides of the cells, invariably opening into intercellular cavities in the subjacent tissue, and appearing to be bordered by a limb when they are viewed from above [68 b c e].

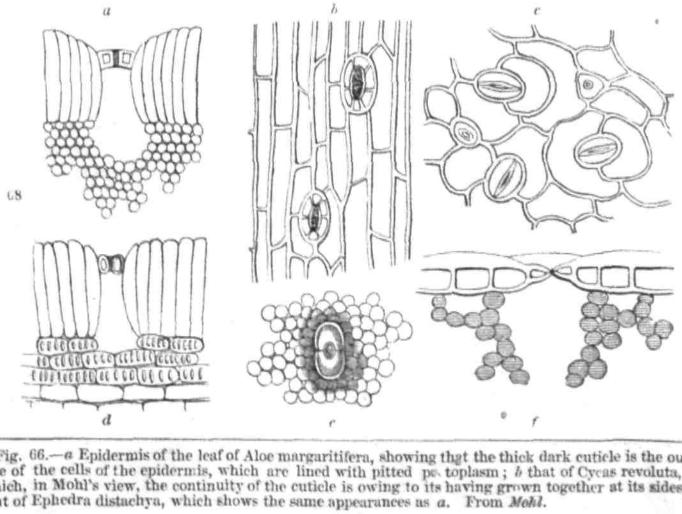
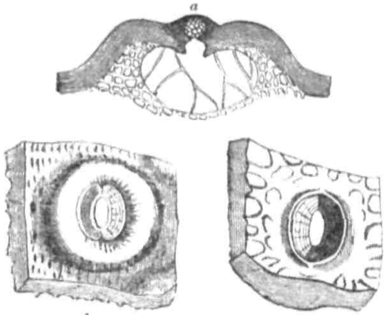


Fig. 66.—*a* Epidermis of the leaf of Aloe margaritifera, showing thgt the thick dark cuticle is the outer side of the cells of the epidermis, which are lined with pitted pe. toplasm; *b* that of Cycas revoluta, in which, in Mohl's view, the continuity of the cuticle is owing to its having grown together at its sides; *c* that of Ephedra distachya, which shows the same appearances as *a*. From *Mohl*.

106. This appearance of a limb is owing to the juxtaposition of two or more elastic vesicles, closing up or opening the aperture which they form, according to circumstances; as is manifest when the stomate is divided perpendicularly to the plane of the epidermis [68 a a f].

But there are some modifications of this structure which deserve notice. In Marchantia the stomates resemble chimneys, and are built up of four tiers, each tier consisting of four cells. In Myzodendron [69], in which they occur singly on the apex of each tubercle of the stem, they are stated by Dr. Joseph Hooker to be incorporated into a uniform integument, presenting no trace of cellular origin, lying over a chamber [69 a] traversed by viscid filaments, and frequently closed up by an opaque mass.



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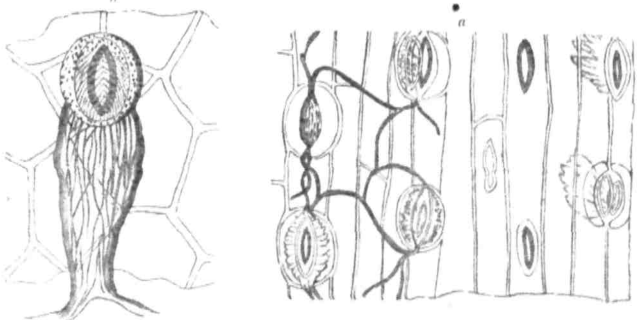
107. It has been asserted that stomates are closed by a membrane, but although that statement was erroneous, it now appears that the cuticle is sometimes extended into the chamber beneath it, in the form of a funnel-shaped expansion, open at both ends, and called the CISTOME [70]. In some



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cases appendages proceed from the edge of the cistome through the intercellular passages, to neighbouring cistomes, which are thus connected with each other.

This was first observed by Gasparrini in 1842, and the presence of these organs has been confirmed by Mohl, who, however, denies the existence of a fibrous structure such as Gasparrini's figures represent.

108. Stomates are found abundantly upon leaves, particularly on the lower surface of those organs; occasionally upon all parts that are modifications of the leaves, especially such as are of a leafy texture; and on the stem.

Fig. 69.—Stomates of Myzodendron punctulatum; *a* section through stomate and epidermis; *b* the stomate seen from without; *c* from within.—*Dr. Hooker.*

Fig. 70.—*a* Cistomes of Ornithogalum nutans; on the left are seen the connecting appendages; *b* a cistome in Cereus peruvianus.—*Gasparrini.*

The following estimate of the number of stomates found on certain leaves, will give an idea of their importance in the vegetable economy :—

	Number of Stomates on a Square Inch.		
	Upper Side.	Under Side.	Both.
Viburnum Tinus	None.	90,000	——
Cerasus Laurocerasus	None.	90,000	——
Crinum amabile	20,000	20,000	40,000
Mesembryanthemum	30,000	40,000	70,000
Aloe	25,000	20,000	45,000
Yucca	40,000	40,000	80,000
Cereus speciosissimus (stem)	——	——	15,000
Stapelia (stem)	——	——	15,000

109. Stomates have not been found upon the roots, nor on colourless parasitical plants, nor the submersed parts of plants, nor on Thallogens ; they are, moreover, rare, or altogether absent, in succulent parts.

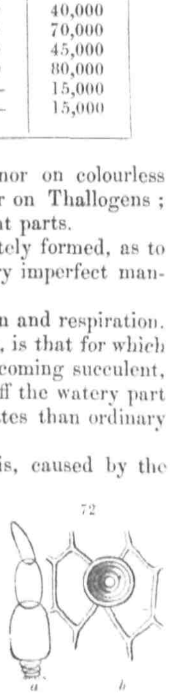
110. It frequently happens, that they are so incompletely formed, as to be either altogether incapable of action, or to act in a very imperfect manner ; as in succulent plants.

111. The function of stomates is to regulate evaporation and respiration. It has been thought that the former function, in particular, is that for which they are destined ; and that the cause of certain parts becoming succulent, is the absence of stomates in sufficient numbers to carry off the watery part of the sap. But some succulent plants have more stomates than ordinary plants, so that this opinion requires reconsideration.

112. False Stomates[72] are openings in the epidermis, caused by the falling off of deciduous hairs[72 a].

113. Hairs are minute expansions of transparent cellular tissue proceeding from the surface of plants. They are of two kinds, lymphatic and secreting.

72



114. *Lymphatic* hairs are formed by vesicles of cellular tissue placed end to end, and not varying much in dimensions.

115. *Glandular* hairs are also formed by vesicles of cellular tissue placed end to end, but are sensibly distended at the apex or base into receptacles of fluid.

116. Lymphatic hairs are for the absorption of moisture, for the protection of the surface on which they are placed, and for the control of evaporation through the stomates. They always proceed from the veins, while the stomates occupy the interjacent parenchyma.

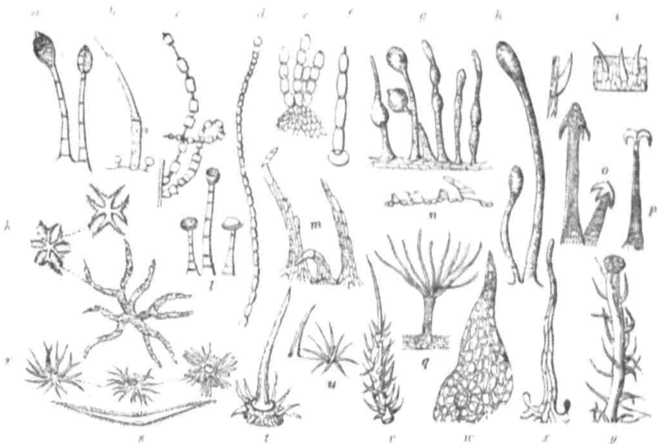
In Campanula, on the style, are placed hairs called collectors, in great number. They originate below the epidermis, and have the singular property of being retractile, the upper part being capable of drawing back within the other ; their use is unknown. Some hairs, moreover, have numerous parallel spiral threads formed in their interior, as in Acanthodium. Others have but one thread, and some are curiously striated.

117. Glandular hairs are receptacles of the fluid peculiar to certain species of plants, such as the fragrant volatile oil of the sweet briar, and the

Fig. 72.—*a* Hair of Nuphar luteum ; *b* the hole formed where it drops off.

acrid cölourless fluid of the nettle, and may be regarded as organs of excretion.

Hairs are simple [i]; setaceous [b]; capitate [l]; strangulated [c]; moniliform [d]; articulated [e f]; septate [a]; compound [m]; knotted [g]; clavate [h]; scabrous [n]; ciliated [y]; glochidiate [o p]; branched [q]; stellate [k r]; scutate [s]; araneose [t]; ramentaceous [w x].



118. Hairs are usually planted, more or less perpendicularly, upon the surface on which they grow. In some cases, however, they are attached by their middle (*peltate*), as in Malpighiaceous and Brassicaceous plants[s].

119. In some instances they are circular disks, called *lepides*, and are formed of a membrane composed of radiating cells.

120. PRICKLES are conical hairs of large size, sharp-pointed, and having their tissue very hard.

IV.—OF THE COMPOUND ORGANS.

121. From peculiar combinations of the elementary organs are formed the compound organs.

122. The compound organs are the axis (123) and its appendages (133 *a*).

123. The Axis may be compared to the vertebral column of animals.

124. It is formed from a spore, embryo, or leaf-bud, by the development of a root in one direction, and of a stem in the opposite direction.

125. A *spore* is a young plant produced in the interior of another, without the agency of sexes, and having no determinate points of growth.

126. An *embryo* is a young plant, produced by the agency of sexes, developed within a seed, and having determinate points of growth.

127. A *leaf-bud* is a young plant, produced without the agency of sexes, inclosed within rudimentary leaves called scales, and developed on the outside of a stem.

128. A spore, or embryo, propagates the species.

129. Leaf-buds propagate the individual.

130. When the vital action of either spore, embryo, or bud is excited, the tissue develops in three directions: upwards, downwards, and horizontally.

131. That part which develops downwards is called the descending axis, or root; that upwards, the ascending axis, or stem; that horizontally, the medullary system; and the part from which these two axes start is called the crown or collar.

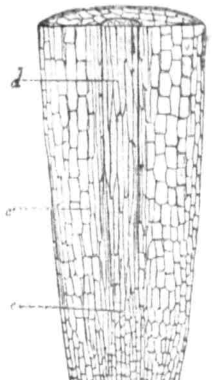
132. This elongation in three directions takes place almost simultaneously; hence it follows that all plants must necessarily have an ascending and descending axis, or a stem and root, and a medullary system.

133. The only apparent exceptions to this occur among the lower order of plants, in which development seems to be either spherical, filamentous, or horizontal.

133 *a*. Every part which grows from this axis in a symmetrical manner is an *appendage* of it. The leaf is the type of all such appendages.

V.—OF THE ROOT.

134. The Root is formed by the descending and dividing fibres of the stem.



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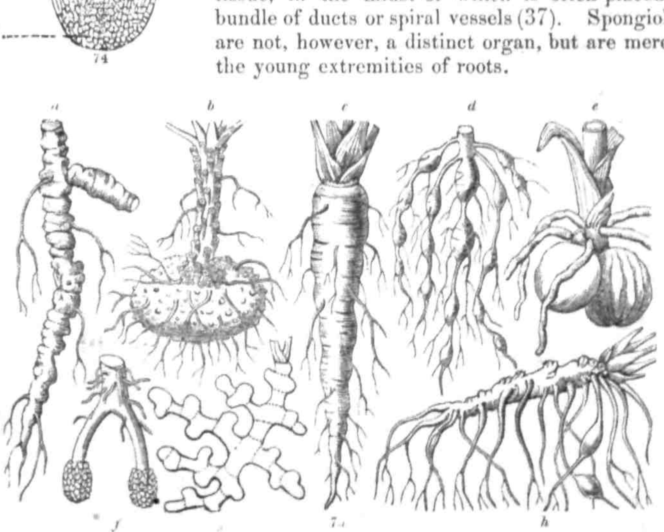
135. Anatomically it differs from the stem in the absence of normal buds, and of stomates (105), and usually in Exogens of pith.

136. Although the root has usually no distinct pith in Exogens, yet it possesses a distinct medullary system.

137. The functions of the root are to fix plants in the earth, and to absorb nutriment from it. As it has to force its way through substances which offer resistance to its passage, it lengthens exclusively by successive additions to the points of its divisions.

138. Absorption takes place almost exclusively by the extremities called *spongelets*, or *spongioles*[74], which consist of a lax coating of cellular tissue lying upon a concentric layer of woody tissue, in the midst of which is often placed a bundle of ducts or spiral vessels (37). Spongioles are not, however, a distinct organ, but are merely the young extremities of roots.



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Roots[75] are nodose [a]; placentiform [b]; conical [c]; moniliform [d]; testiculate, or tubercular [e]; corralloid [g]; tuberous [h]; and fasciculate[76], when in clusters, as in the Asphodel.

Fig. 74.—Young roots of an Orchis divided lengthwise; *s p* spongiole *c c* central cells, which gradually give rise to *d*, or bothrenchyma.

139. Occasionally the epidermis separates from the end of the roots in the form of a cup or cap[75 f], as in Pandanus and Lycopodium, and forms a *pileorhiza*.

140. The power of affording nutriment to the stem and other parts, is not possessed by the root, exclusively in consequence of its absorption from the soil. The root is often a reservoir of *organizable*, that is to say, of *various kinds of nutritious matter ready formed*, especially starch, (81) and gum or jelly (75), upon which the young stem will feed, even although the root itself be cut off from communication with any source of supply.

Moniliform, tuberous, testiculate, fasciculate, placentiform, conical, roots,—in short, all which are unusually thickened,—are intended by Nature as reservoirs of food.

76

77

78

They must not be confounded with tubers, rootstocks, or corms, all which are *forms of stem* The fasciculate[76] owes its appearance to a general enlargement of the fibres ; the moniliform[77] is distended here and there unequally along the whole length of a fibre ; the tuberous[78] is enlarged at some one point only ; but in all such cases the tendency to enlarge is a constant attribute, attended by the deposit in the swellings of organizable matter of some kind.

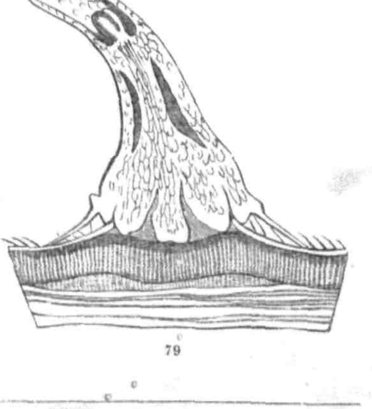
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Fig. 79.—Young plant of the parasite Myzodendron growing into the bark of a Fagus.—*J. Hooker*

141. The most remarkable anomalies among roots are those of *parasites* [80], which terminate abruptly in a kind of sucker buried in the cellular matter of the plant preyed on, and of some epiphytes [79] in which they acquire a green colour, are furnished with stomates, and perform the functions of both roots and stems.

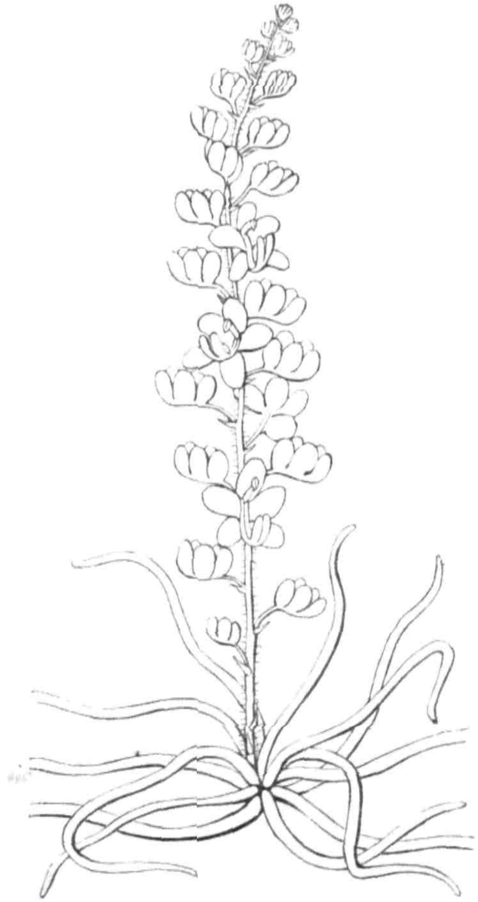


Fig. 80.—Chiloschista usnevides, with its green epiphytal roots acting the part of leaves. Angræcum funale and Lindeni offer similar examples.

VI.—OF THE STEM.

142. The STEM is produced by the successive development of leaf-buds, which cause a corresponding horizontal growth between them.

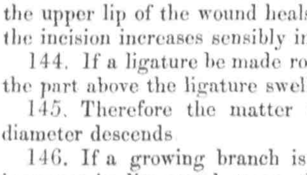
143. If an annular incision be made below a branch of an Exogen, the upper lip of the wound heals rapidly, the lower lip not: the part above the incision increases sensibly in diameter, the part below does not.

144. If a ligature be made round the bark of an Exogen, below a branch, the part above the ligature swells, that below it does not swell.

145. Therefore the matter which causes the increase of Exogens in diameter descends

146. If a growing branch is cut off below a leaf-bud, that branch never increases in diameter between the section and the first bud below it.

147. The diameter of all Exogenous stems increases in proportion to the number of leaf-buds developed.



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148. The greater the number of leaf-buds above a given part, the greater the diameter of that part; and *vice versâ*.

149. In the spring the newly forming wood is to be traced in the form of organic fibres descending from the leaf-buds; that which is most newly formed lying on the outside, and proceeding from the most newly developed buds.

150. Therefore the descending matter, by successive additions of which Exogens increase in diameter, proceeds from the leaf-buds.

151. The elongation of the leaf-bud upwards gives rise to new axes (123) with their appendages; their elongation downwards increases the diameter of that part of the axis which pre-existed, and produces roots.

152. Roots, therefore, in all cases, should consist of extensions of the woody tissue; and this is conformable to observation.

153. Hence, while the stem is formed by the successive evolution of leaf-buds, the root, which is the effect of that evolution, has no leaf-buds.

154. The leaf-buds thus successively developed are firmly held together by the medullary system of the stem, which proceeds from the bark inwards, connecting the circumference with the centre.

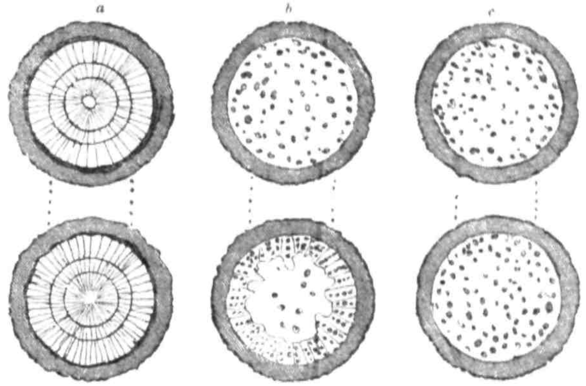
155. The stem varies in structure in four principal ways.

156. It is either formed by successive additions to the outside of the wood, when it is called *Exogenous* [82 a]; or by successive additions to its centre, when it is called *Endogenous* [82 c]; or by the union of the bases of leaves, and the extension of the point of the axis which is called *Acrogenous*, or by simple elongation or dilatation, where no leaves or buds exist, as among *Thallogens*.

157. In what are called *Dictyogens* [82 b], the stem has the structure of Endogens, the root that of the stem of Exogens nearly; *Ex.* Smilax.

Fig. 81.—These two diagrams represent the difference in the size of the rings of wood in a tree, one of whose branches, *a*, had lost the greater part of its buds, and *b* had suffered no such injury.

158. The stem of EXOGENS may be distinguished into the Pith, the Medullary Sheath, the Wood, the Bark, and the Medullary Rays.



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159. The PITH consists of cellular tissue, occupying the centre of the stem.

160. It occasionally contains scattered spiral vessels, which appear to originate in the medullary sheath, or scattered bundles of *fibrovascular*, that is to say, of vascular and woody, tissue, as in Ferula, and many tubers.

161. It is produced by the elongation of the axis upwards.

162. It serves to nourish the young buds until they have acquired the power of procuring nourishment for themselves. For this purpose it is often filled with starch, which, in the process of vegetation, becomes converted into gum; and the latter, when dissolved, passes out of the pith into the nascent organs.

163. It is always solid when first organized; but, in some cases, it separates into regular cavities, as in the Walnut, when it is called *disciform*; or it tears into irregular spaces, as in Umbelliferous plants.

164. Its office of nourishing the young parts being accomplished, it is of no further importance, and dies.

165. The MEDULLARY SHEATH consists of spiral vessels[85 t], [83 a].

166. It immediately surrounds the pith, projections of which pass through it into the medullary rays[83 b 85 86].

167. It is in direct communication with the leaf-buds and the veins of the leaves.

168. It carries upwards oxygen, liberated by the decomposition of carbonic acid or of water, and conducts it into the leaves.

169. The WOOD lies upon the medullary sheath, and consists of concentric layers.

170. It is formed by the successive deposit of organised matter descending from the buds, and by the interposition of the medullary system, here called medullary rays, connecting the pith and the bark[83 b b].

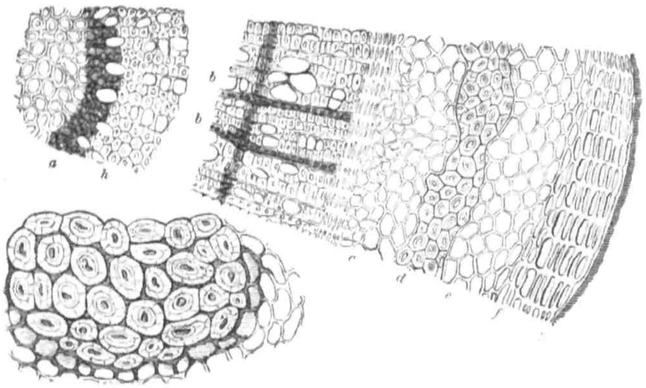
Its pleurenchyma acquires hardness by the deposit of sclerogen (71) in its tubes[84].

171. The first concentric layer lies immediately upon the medullary sheath and pith, and consists of woody and vasiform tissue[83 h].

172. Each succeeding concentric layer consists of thin wedges of woody

and vasiform tissue, which either form themselves into distinct strata, in which case the latter is innermost, or are confounded together.

83



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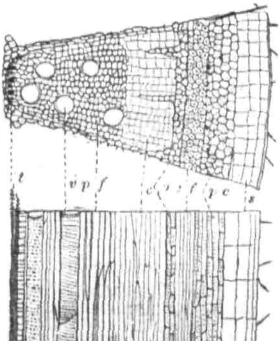
These wedges are Schleiden's *indefinite vascular bundles*, and have the power of increasing indefinitely at their back, that is to say, on the side next the circumference.

173. When there is any material difference between the compactness of the tissue of the two sides of a concentric layer, zones are formed, in which the outermost tissue is chiefly woody, and most compact; but when the vasiform and woody tissues are equally intermingled, no apparent zones exist.



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174. A concentric layer, once formed, never alters in dimensions.

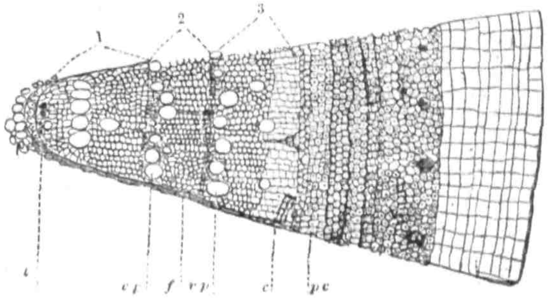
175. Each concentric layer, which is distinctly limited, is the produce of one year's growth in countries having a winter and summer.

The annexed cuts will make this clearer, and show how the appearance of zones is produced, as well as offering a representation of the anatomy of a common exogenous tree.

176. Therefore, the age of an Exogenous tree should be known by the number of concentric circles of the wood [85]. But this rule is of uncertain application, owing to numerous disturbing causes, especially in countries in which the period of rest is less distinctly marked than in the winter of northern latitudes.

Fig. 85.—Represents a transverse and longitudinal section of a branch of Maple in the beginning of the second year; *t* the medullary sheath; *v p* bothrenchyma; *f* pleurenchyma of the first year; *c* the newly formed wood; *p c* the tissue forming medullary rays; *f* the liber; *p c* the mesophlœum; *s* the epiphlœum.

Such is the usual explanation of the cause of the zoned appearance of the woody system of Exogens; but I have seen stems of trees from Calcutta, which I was assured had produced four rings a year, and the common Garden Beet, which



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produces in its roots many rings, is an example of zoned growth, which cannot be explained by the common theory.

177. The secretions of plants are deposited most abundantly in the oldest concentric layers; while those layers which are most recently formed contain but a slight deposit.

87

178. When the tissue of the concentric layers is filled with secretions, it ceases to perform any vital functions.

179. The dead and fully formed central layers are called the *heart-wood*.

180. The living and incompletely formed external layers are called the *alburnum*.

181. Upon the outside of the wood lies the BARK, which, like the wood, consists of concentric layers.

182. It may usually be distinguished into four distinct parts: 1. the *Epidermis* [89 a]; 2. *Epiphlœum* [88 89 b]; 3. the *Mesophlœum* [88 89 c]; and 4. the *Endophlœum*, or *Liber* [88 89 d].

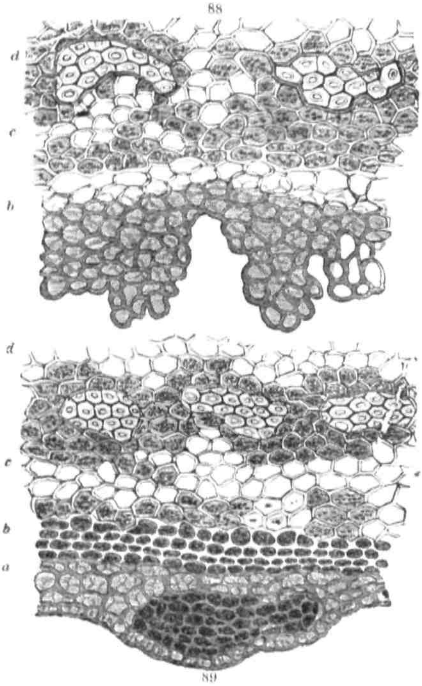
183. Each of these parts increases by successive additions to its own inside, except the epidermis, which is never renewed.

184. The Epiphlœum and Mesophlœum are both formed of cellular tissue only; but their cells are placed in different directions with respect to each other. The former is often large and soft, and may separate spontaneously from the young layers forming beneath it: as in Cork, which is the epiphlœum of Quercus Suber, the cork-barked oak.

185. The Endophlœum, or Liber, consists of cellular tissue resting on the alburnum, of laticiferous tissue (49), and of pleurenchyma (32). The tubes of the latter are often thickened rapidly by a deposit of sedimentary matter; in which case, sections of the tubes present the appearance of concentric circles. Hence arises the toughness of the tubes of pleurenchyma which occur in the liber, and are manufactured into cordage, as in the Lace-bark tree, the Lime-tree, &c.

Fig. 86 is the same as Fig. 85, three full years old, with the layers of bark more thick and numerous, and the limits of each year's growth of wood indicated by figures on the upper edge.
Fig. 87.—Section of an Oak branch eight years old.

186. Occasionally the liber is only *formed during the first year's growth*; after which it is inclosed in wood, and is eventually found near the pith. This has as yet been observed only among Menispermads.



187. The power of renewing themselves by the production of new matter upon their inner surface, is apparently given to the layers of bark in order to compensate for the gradual and incessant distension of the wood beneath them.

188. As the older parts die, from becoming too small to bear the strain upon them, new parts form, each in its allotted place, and take the station of *that which went before it.*

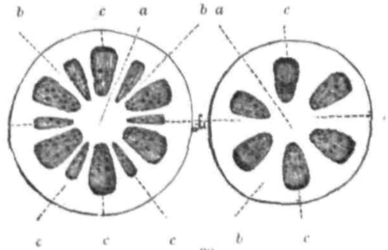
189. The secretions of plant are often deposited i the bark in preference to an other part.

190. Hence chemical or me dicinal principles are mor *often to be sought in the bar* than in the wood.

191. The immediate func tions of the bark are to protec the young wood from injury and to serve as a filter throug which the descending elabo rated juices of a plant ma pass horizontally into the stem *or downwards into the root.*

192. The Medullary Rays, or Plates, (the *silver grain* of carpenters, consist of cylinders, or compressed parallelograms, of cellular tissue (*muri form cellular tissue*), belonging to the medullary system.

They are, in reality, the cellular mass of the stem, pressed into plates of variou thickness by the wedges of woo that form within it. This is explained by the annexed diagram, in which the right hand figure represents a section of a young stem with six wedges of wood, and the left an older with twelve; in both ^{a} is the pith, ^{b} the medullary rays, and ^{c} the wedges of wood. When bark is stripped off a branch, the medullary rays resemble narrow sharp ellipses of cellular matter separated by pleurenchyma [91].



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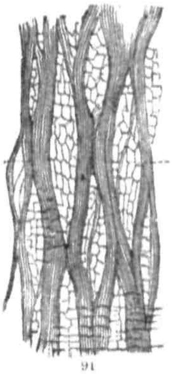
Figs. 88, 89.—Cross sections of bark.

194. They connect together the tissue of the trunk, maintaining a communication between the centre and the circumference.

195. They act as braces to the woody and vasiform tissue of the wood. They convey secreted matter horizontally from the bark to the heart-wood, and they generate adventitious leaf-buds.



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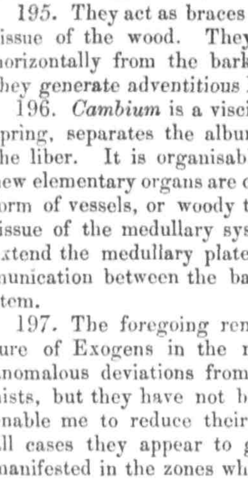
196. *Cambium* is a viscid secretion, which, in the spring, separates the alburnum of an Exogen from the liber. It is organisable mucilage, out of which new elementary organs are constructed, whether in the form of vessels, or woody tissue, or of that cellular tissue of the medullary system, whose office it is to extend the medullary plates, and maintain the communication between the bark and central part of a stem.

197. The foregoing remarks apply to the structure of Exogens in the normal state. Numerous anomalous deviations from it are known to botanists, but they have not been sufficiently studied to enable me to reduce their irregularity to rule. In all cases they appear to grow normally at first, the irregularities being manifested in the zones which follow the first.



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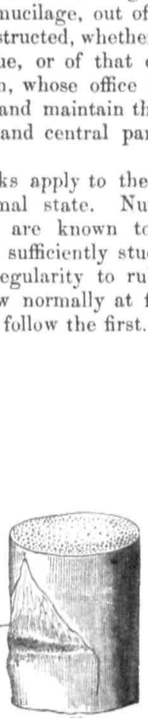

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198. As Exogenous plants increase by annual addition of new matter to their outside, and as their protecting integument or bark is capable of distension in any degree, commensurate with the increase of the wood that forms below it, it follows, taking all circumstances into consideration, that there are no assignable limits to the life of an Exogenous tree.

199. The stem of **Endogens** offers no absolute distinction of Pith, Medullary Rays, Wood, and Bark [92].

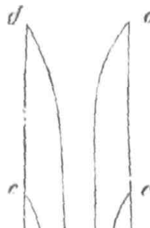
200. It is formed by the *intermixture of bundles of* fibro-vascular tissue among a mass of cellular tissue, the whole of which is overlaid by a zone of cellular and woody tissue, inseparable from the stem itself, and therefore not bark.

Fig. 93.—Highly magnified representation of a transverse section of one of the fibro-vascular bundles of a Palm-tree; * the centre of the stem; *a* laticiferous tissue; *b* cellular tissue of the medullary system; *c* pleurenchyma; *d* spiral vessels; *e* bothrenchyma.

These bundles are generally formed, 1 of a gutter, or crescent-shaped line of pleurenchyma, *having its convexity next the circumference;* 2 of prismatical cellular tissue lying in its concavity; and 3 of spiral vessels and large bothrenchyma embedded in the second. Over this there is sometimes placed another cord of pleurenchyma next the axis. Each of these bundles may be regarded as being analogous to a woody wedge *of the first year* in an Exogenous stem, the gutter of pleurenchyma representing the wood, the spiral vessels the medullary sheath, and the prismatical cellular tissue the pith. Such vascular bundles have not, however, the power of indefinite growth (172), but have a determinate size and structure to which after-growth makes no addition.

201. It increases by the successive formation of new bundles of fibro-vascular tissue in the central cellular tissue, rising upwards into the leaves where they form veins, and curving outwards as they descend.

The old notion was that the fibro-vascular bundles passed down the interior of the stem, as represented in the diagram [94]; but the fact is that they form arcs, as is represented at [95]. These bundles are, however, very far from descending perpendicularly; on the contrary, their course is both tortuous and aslant, so that the mass of bundles is an extremely complicated entanglement. Grasses offer no exception to this rule, the entanglement of their fibro-vascular bundles taking place at the diaphragms of their nodes; their fistular character did not exist originally, but results from their surface growing faster than their centre.



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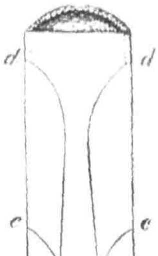

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202. The vascular bundles of the centre gradually force outwards those which were first formed, the cellular mass augments simultaneously, and in this way the diameter of a stem increases.

203. What appears to be bark in these plants is an external layer of cellular tissue, into which the lower extremities of the arcs of fibro-vascular tissue descend obliquely, losing their vascularity as soon as they reach the cortical integument, or ***false-bark.***

204. It is in consequence of this passage in an oblique direction of the fibro-vascular bundles into the external cortical integument, that the latter can never, in Endogens, be separated from the wood beneath it.

205. The diameter of the stem of an Endogenous plant is determined by the power its tissue possesses of distending, and by its hardness.

206. When the external tissue has once become indurated, the stem can increase no further in diameter.

207. When the tissue is soft and capable of continual distension, there is no more certain limit to the life of an Endogen than of an Exogen (198).

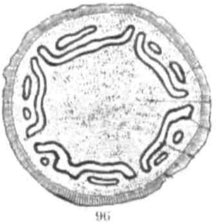
208. In many cases the terminal bud only of Endogens is developed; but very often a considerable number develope; *Ex.* Asparagus.

209. When a *terminal bud only* of an Endogenous plant developes, the stem is generally cylindrical; *Ex.* Palms: when several develope, it becomes conical; *Ex.* Bamboo.

210. In ACROGENS no other stem is formed than what arises from the simple union between the bases of the leaves and the original axis of the bud from which they spring, and which they carry up along with them.

211. In the order of Ferns the section of a stem indicates the same structure as that of the numerous petioles out of which it is constituted.

> This is sufficiently apparent if the leaf-stalk of a Fern-leaf is cut through and its fibro-vascular tissue compared with that of the stem. Eventually these stems become hollow, but they are originally solid [96 97].



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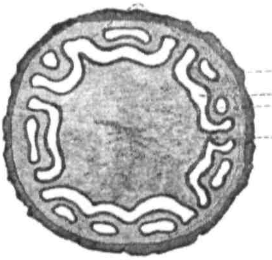

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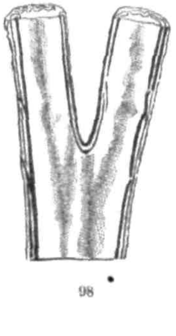
212. Usually the stem of a Fern is simple, but it occasionally forks, apparently by the accidental formation of a double bud at its extremity.[98]

213. Very large scars [99] are left on its surface, upon which are visible the ends of the fractured fibro-vascular tissue which corresponds with the sinuous zones of wood. These scars, which are at first true rhombs, and touch each other, are, after a time, separated by *considerable intervals*, and become much



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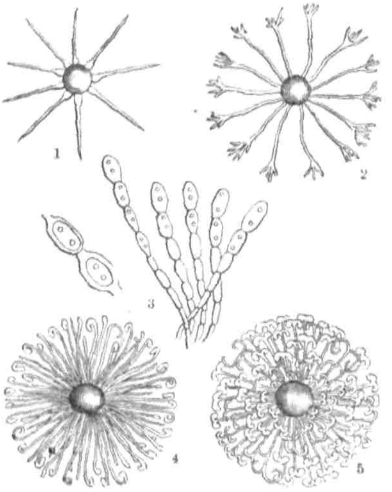
Figs. 96 and 97.—Two horizontal sections of the stem of a Cyathea; *a* pith; *b* zone of wood, formed of the fibro-vascular tissue of the petioles, coated externally with brown pleurenchyma, and inclosing scalariform vessels at *v v*; *e* a cortical integument answering to the epidermis of the connate petioles.

longer than broad, thus proving that the whole tissue of the stem of a Fern stretches for a long time after it is first formed and hardened.

214. With THALLOGENS, which are mere expansions of cellular matter, sometimes in all directions, the axis disappears and nothing remains but threads[99*] woven into a kind of skin or absolutely separate, or even separate cells, or thin leaf-like plates, lobes, or expansions of various forms.



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215. The stem of a plant assumes numerous and very different appearances in different plants.

Among the commonest of its anomalous appearances are the following :—ascending [100 b] ; creeping [f] ; articulated [g] ; leafless, succulent, and deformed [c] ; foliaceous [e].

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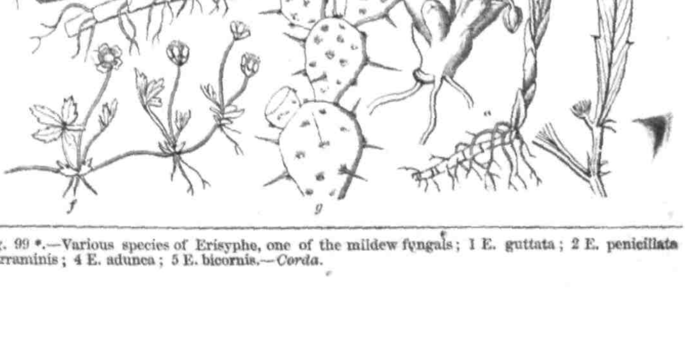


Fig. 99 *.—Various species of Erisyphe, one of the mildew fyngals ; 1 E. guttata ; 2 E. penicillata 3 E. graminis ; 4 E. adunca ; 5 E. bicornis.—*Corda*.

216. It often burrows beneath the earth, when it is vulgarly called a *creeping root*[100 b]. Sometimes the internodes become much thickened, when what are called *tubers*[103 d] are formed; or the stem lies prostrate upon the earth, emitting roots from its under side, when it is called a *rhizome*, or rootstock[100 a].

One of the most remarkable of the modifications of the tuber is that of the Arrow-root, Maranta arundinacea[101], in which stems are directed almost perpendicularly downwards instead of upwards, are covered with broad scales, and become large reservoirs of starch. The buds of the potato often assume the tuberous condition, even when produced above ground, exposed to light and air[103 d]. A similar property exists in Sedum amplexicaule, which forms little cylindrical tubers on its stem, enfolding them in the axil of the leaves in which they were generated.

101

217. If it distend underground, without creeping or rooting, but always retaining a roundish figure, it is a *corm*[103 a 104 105].

Corms invariably form themselves one year, and perish the next in organizing a new corm, which preys upon its parent, and destroys her. In the Crocus[104] this happens by the production, year after year, of a terminal bud. In the Colchicum[105] the new bud is lateral. A corm-bud produces a flower-stem first, and a new corm expands at its base as the leaves grow and furnish food for its supply.

218. All these forms of stem are vulgarly called roots.

219. No root can have either scales, which are the rudiments of leaves, or nodes, which are the rudiments of buds. A *scaly root* is, therefore, a contradiction in terms.

220. The ascending axis, or stem, has nodes and internodes.

But they may be exceedingly small, or crowded together, as in the *crown* of the root[103 e], in which case a plant is technically called stemless.

221. *Nodes* are the places where the leaves are expanded and the buds formed.

222. *Internodes* are the spaces between the nodes.

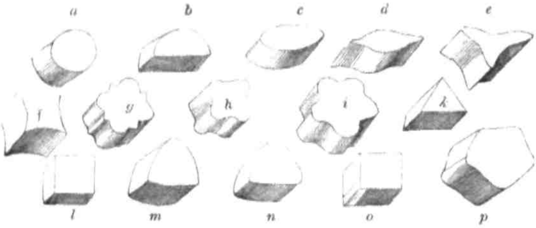
223. Whatever is produced by the evolution of a leaf-bud (227) is a branch.

224. A *spine* is the imperfect evolution of a leaf-bud, and is, therefore, a branch.

225. All processes of the stem which are not the evolutions of leaf-buds, are mere dilatations of the cellular integument of the bark. Such are *prickles* (120).

226. In solid form the stem is extremely variable ; the following [102] are common terms relating to it :—

Terete [a] ; half-terete [b] ; compressed [c] ; plano-compressed [c] ; two-edged [d] ; acute-angled [e] ; obtuse-angled [h] ; triangular [k] ; quadrangular [h] ; quinquangular [i] ; octangular [g] ; multangular [g] ; triquetrous [e] ; tetraquetrous [f] ; obscurely triquetrous [m] ; trilateral [n] ; quadrilateral [o] ; quinquelateral [p]. The figures show that some of these are convertible terms.



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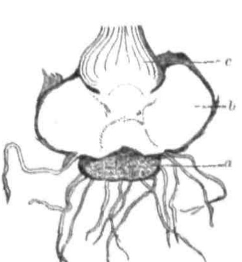

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Fig. 104.—*a* Old corm ; *b* present corm ; *c* coming corm, in a Crocus.
Fig. 103.—Colchium ; *r* Roots ; *f* leaf ; *a'* old stem of the previous year withered ; *a''* present corm ; *a'''* beginning of new corm.

VII.—OF THE LEAF-BUDS.

227. Buds are of two kinds, Leaf-buds and Flower-buds. Leaf-buds (*Bourgeon*, Fr.) consist of rudimentary leaves surrounding a *growing* (vital) *point*, which lengthens upwards, and produces leaf after leaf upon its surface.

The accuracy of this statement is conclusively established by the excellent observations of De Mercklin, who has proved that the growing point is not an imaginary organ, but a cellular tumour having a peculiar organization.

228. Flower-buds (*Bouton*, Fr.) consist of rudimentary leaves surrounding a *fixed* (vital) *point*, and assuming, when fully developed, the form of floral envelopes or apparatus.

106

229. Notwithstanding this difference, a leaf-bud sometimes indicates a tendency to become a flower-bud; and flower-buds frequently assume the character of leaf-buds; *Ex.* Monstrous Pears.

This will be more particularly adverted to in speaking of the Flower.

230. In appearance, a leaf-bud[106] is a collection of scales arranged symmetrically one above the other. These scales are rudimentary leaves. The centre over which they are placed, or the *growing point*, is cellular substance coated with a thin stratum of spiral vessels; and these two parts answer to the pith and the medullary sheath in Exogens.

De Mercklin has shown that the evolution of a leaf-bud is not very unlike the gradual drawing out of the slides of a telescope; that young leaves are continually formed below the end of the growing point, and that, consequently, the lowest leaves of a leaf-bud are necessarily the oldest. That the scales are rudimentary leaves was long ago shown by the gradual changes which take place in the scales when a bud unfolds[107 c]; the careful observer just alluded to has demonstrated that leaves are always, when very young, shaped like the scales of the bud; in fact, the latter are leaves formed at the latter end of the year, and arrested in their growth.

231. By the growth of a leaf-bud a branch is formed; such of the scales as are alive gradually changing into true leaves as vegetation advances[107 c].

232. Sometimes leaf-buds separate spontaneously from the stem (are deciduous), and are then called *bulbills* or *bulblets*[107 f]; *Ex.* Lilium bulbiferum.

233. In other cases they are of large size, and are formed underground; they then form *bulbs*, or *scaly bulbs*[107 a b].

234. In bulbs, other young buds or bulbs, called *cloves*, are often formed in the axils of the scales, as in Garlic; and these gradually destroy the old bulb by feeding upon it.

In like manner corms produce other corms, and are destroyed by their offspring, as has been already shown (217). Thus, in some Gladioles[107 d e], an old corm produces the new one always at its point; the latter is then seated on the remains of its parent, and, being in like manner devoured by its own offspring,

becomes the base of the third generation [103 e]. This process enables such plants by degrees to raise themselves out of the earth in which they were born.

107

235. Both corms and bulbs are reservoirs of nutriment in either a starchy or mucilaginous condition, or both.

236. Leaf-buds are of two kinds, the regular and the adventitious.

237. *Regular* or *normal* Leaf-buds are only found in the axils of leaves.

Commonly they are single, but in some plants they exist in great numbers, and then they obey two different laws of development; the lowermost in some being

108

109

the most advanced, as in Lonicera tatarica [109]; and the highest in others, as in the Walnut [108]. Several are sometimes on the same plane, as in the Willow or Poplar, and then the laterals have been supposed to belong to stipules.

238. They exist in a developed or undeveloped state in the axils of all leaves, and of all modifications of leaves.

239. Therefore they may be expected to appear at the axils of scales of the bud, of stipules, of bracts, of sepals, of petals, of stamens, and of carpels, in all which situations they are generally undeveloped; for these different organs are all modifications of leaves.

The proofs of this theory will be given hereafter.

240. They are frequently not called into action, even in the axils of leaves, but lie dormant.

241. As regular buds are only found in the axils of leaves, or of their modifications, and as branches are always the development of buds, it

follows, that, whatever may be the arrangement of the leaves, the same wil be the disposition of the branches; and *vice versâ*.

242. This corresponding symmetry is, however, continually destroyed b the unequal development of buds, or by the accidental destruction of a par of them.

243. Leaf-buds which are formed among the tissue of plants subsequentl to the development of the stem and leaves, and without reference to th latter, are called latent, adventitious, or abnormal.

244. *Adventitious* Leaf-buds may be produced from any part of th medullary system, or wherever cellular tissue is present. It has bee distinctly proved, that, while roots are prolongations of the vertical or wood system, leaf-buds universally originate in the horizontal or cellular system.

245. They are formed in the root, among the wood, and at the margin or on the surface of leaves, whether perfect or rudimentary.

This is now a well-known fact. The following example of it was related in the *Gardeners' Chronicle* for October 18th, 1845:—"A Hyacinth bulb, in a state of rapid putrefaction, while kept in contact with the cold water of a hyacinth-glass in a dwelling-house, entirely renewed its vitality when removed to a warm situation. The decay had eaten completely through the base of the scales into the very heart of the hyacinth, which was putrid. The foul slimy matter was wiped off, and the bulb was placed, its base upwards, on a layer of warm sand, covering the bottom of an earthen pan. The sand was moistened with water of a temperature of 80°, or thereabouts; a bell-glass was placed over the bulb, with its edges pressed into the sand; and the apparatus was put on a shelf near a

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north window, about four feet above an Arnott stove in constant action. From time to time warm water was given by pouring it upon the sand between the edge of the earthen pan and the side of the bell-glass. Decay was immediately arrested; for some time the bulb remained dormant; but, by degrees, healthy granulations made their appearance, displacing the decayed matter; and in a few weeks a fine crop of young bulbs sprouted forth on the surface of the scales and on the edges of the healed-up sores." In this case, as in all of a similar nature, the new buds appeared from the parenchyma exclusively; and many of them became completely organized as small bulbs before the vitality of the parent

bulb was exhausted. The bulbs formed on the petiole of Arum ternatum [108 c] are of a similar origin.

246. They are constructed anatomically exactly as regular buds, having a growing point in their centre.

247. *Embryo-buds* are woody nodules found in the bark of trees, and appear to be rudimentary branches formed without leaves, within a space in which they are forcibly pressed upon by surrounding tissue.

They are common in the bark of the Beech, the Elm, and the Cedar of Lebanon; and not uncommonly grow into stunted branches. Very curious examples of such growth occasionally occur in damp tropical countries.

247 *a*. The manner in which the leaves are folded in the leaf-bud varies with species, and is called the *vernation* of a plant. The following are the principal forms:—

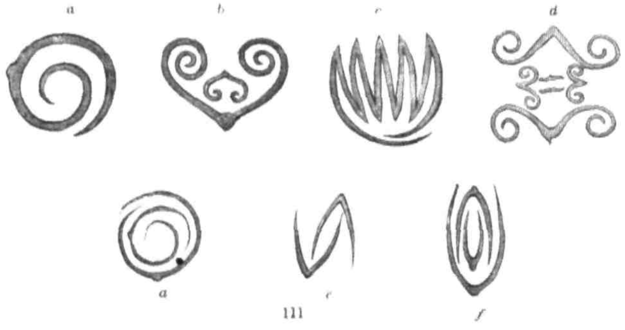


Fig. 111.—*a a* Convolute; *b* involute; *c* plicate; *d* revolute; *e* obvolute; *f* equitant.

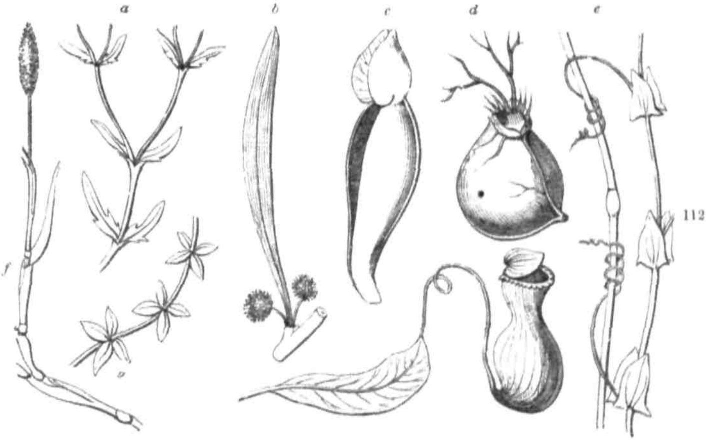
VIII.—OF THE LEAVES.

248. A leaf is an expansion of the bark immediately below the origin of a regular leaf-bud, and is an appendage of the axis.

249. Wherever a regular leaf-bud is formed, a leaf, either perfect or rudimentary, has been developed also ; and *vice versâ*.

250. Leaves are developed alternately [112 f], one above and opposite the other, around their common axis ; or upon the same plane, when they are opposite [112 a] or verticillate [112 g]. They are never produced side by side, except by irregular development.

It has been assumed that the opposition and verticillation of leaves is in consequence of the non-development of internodes, and this is probably true ; but



there is no absolute proof of it. The hypothesis is founded upon the well-known fact, that verticillate leaves will become alternate, if the branch on which they grow is from any cause compelled to grow much faster than usual.

251. There is a constant tendency in opposite or verticillate leaves to become alternate.

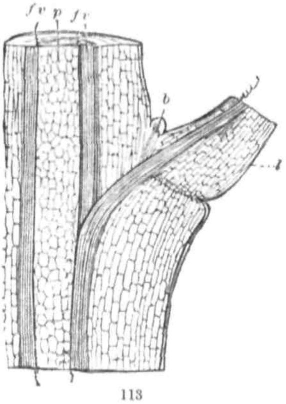
252. This is equally true of the arrangement of all parts that are modifications of leaves.

253. When leaves are formed, the point appears first, and afterwards the increase of growth takes place at the base.

This accounts for the little injury sustained by leaves when their ends are destroyed by accidents, and is quite analogous to the manner in which the layers of bark increase (183). In fact, since each layer of bark increases by addition to its inner face, so should leaves, which are expansions of bark, increase at their base, which answers to that inner face.

254. A leaf may consist of a *petiole* or stalk, a *lamina* or blade, and a pair of *stipules* : but any one of these parts may represent the leaf.

255. The PETIOLE is the channel through which the vessels of the leaf are connected with those of the stem ; it is formed of one or more bundles of spiral vessels and woody tissue, inclosed in a cellular integument. It is often absent, and then a leaf is called sessile.



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256. The spiral vessels of the leaf of Exogenous plants derive their origin from the medullary sheath [113] ; those of Endogens from the bundles of fibro-vascular tissue (200).

257. The cellular integument of the petiole is a continuation of that of the bark.

258. When the petiole is leafy and the lamina is abortive, it is called a *phyllodium* [112 b].

259. When the petiole becomes dilated and hollowed out at its upper end, the lamina being articulated with and closing up its orifice, as in Sarracenia [112 c] and Nepenthes [112 h], it is called a *pitcher* or *ascidium* ; if it is unclosed, and is a mere sac, as in Utricularia, it is called *ampulla* [112 d].

260. Sometimes the petiole has no lamina, or is lengthened beyond the lamina, and retains its usual cylindrical or taper figure, but becomes long, and twists spirally ; such a petiole is called a *tendril* [112 e] (Vrille, *Fr.*)

The petiole is usually either taper, or channelled ; and it has often a boss or struma [114 g], (coussinet, Fr.) at either its base or apex, especially in those leaves which are sensitive. In other cases it is inflated [b], sheathing [a], amplexicaul, winged [e], auriculate, leafless, jointed [d], spinescent [f], &c.

a b c d e f

114

g h

261. The petiole is sometimes ***articulated transversely***, as in the Orange.

262. The LAMINA of a leaf is an expansion of parenchyma, and is

Fig. 113.—Section of a stem and of the petiole of a leaf, showing the connection between the two; *p* the pith ; *fv* the fibro-vascular tissue, whose inner face consists of spiral vessels, and is the medullary sheath ; *l* the base of the petiole of the leaf ; *b* a bud in its axil.

traversed by veins which are ramifications or extensions of the bundles of vascular tissue of the petiole, or, when there is no petiole, of the stem [113].

263. Sometimes one, sometimes both the surfaces of a leaf are furnished with stomates (150).

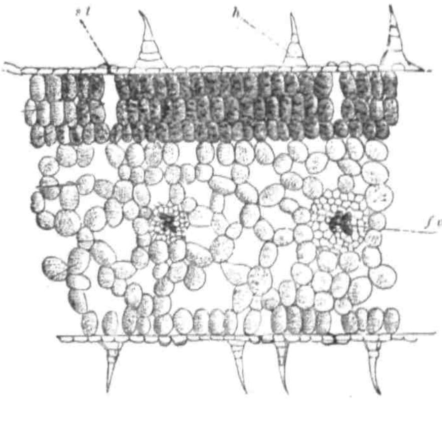
264. The veins either branch in various directions among the parenchyma, anastomosing and forming a kind of net-work, or they run parallel to each other, being connected by single tranverse unbranched veins.

265. The former is characteristic of Exogenous, the latter of Endogenous plants.

266. The principal vein of a leaf is a continuation of the petiole, and runs in a direct line from the base to the apex of the lamina; this vein is called the *midrib*. It usually produces other veins from its base or sides, or from both: such veins are called *ribs*, if very strong, and proceeding from the base to the apex; under other circumstances, they are frequently named *nervures*.

267. The veins are interposed among cavernous cellular substance, called *diachyma*, *diploe*, or *mesophyllum*, which is often stratified differently below the two surfaces of the leaf; the upper stratum being more compact than the lower, and having its cells perpendicular to the plane of the leaf. In such cases, the cells of the lower stratum are commonly more or less parallel with the under surface.

Although this is certainly the commonest arrangement of the elementary organs of a leaf, yet it is attended with numerous exceptions. In many leaves, especially in those which present their edge to the sky, there is no difference in the anatomy of the two sides. In submersed leaves [116] the cavernous character is lost, and a solid parenchyma is merely furnished with occasional air-cells or lacunæ.



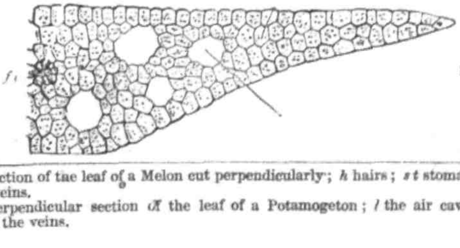


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Fig. 115.—A section of tae leaf of a Melon cut perpendicularly; *h* hairs; *st* stomates; *fv* fibro-vascular tissue of the veins.

Fig. 116.—A perpendicular section of the leaf of a Potamogeton; *l* the air cavities *fv* the fibro-vascular tissue of the veins.

h. All the parts of a leaf are symmetrical when first born, and the rudiment of every leaf is a body symmetrically placed with regard to the axis.

i. In compound leaves the young leaflets are always opposite.

k. All the parts of the rudimentary leaf are susceptible of development. In general this proceeds from the point of the leaf to its base, but most commonly it is more active and more considerable at the base than near the point. Development enlarges the leaf in every direction, and predominates in particular directions.

l. The *lamina* of the leaf is formed first; its leafy sides are extensions of it, whether equal sided or unequal sided.

m. *Teeth* and *crenells* appear to be owing to the development of certain rows of cells on the edge of the leaf. Not a trace of them is to be found on the youngest leaves, whose sides are commencing their formation.

n. The *stipules* of Dicotyledons, because of the great length of the petiole, appear like organs independent of the lamina. The rapidity of their development is probably owing to their position, close to the axis. Their blade covers the axis or other organs during its growth.

o. The *petiole* grows chiefly in one direction; of all the parts of a leaf it is that which grows most, if its small original volume is taken into consideration.

p. Although most of these views are founded on fact, nevertheless they cannot be regarded as having a perfectly solid basis until the internal life of the parenchyma of the leaf and its products shall have been well observed. It is that which now remains as the great object of investigation as regards the history of leaves; for hitherto little more has been done than to follow their successive transformations.

289. All leaves are originally continuous with the stem. As they grow, an interruption of their tissue at their junction with the stem takes place, by which a more or less complete articulation is formed, sooner or later.

290. The articulation between a leaf and stem being completed, the tissue of the former becomes gradually incrusted by the foreign matter deposited by the sap in the process of secretion and digestion, and at last is incapable of further action, when it dies. When the stem continues to increase in diameter, the dead leaf not increasing with it, the latter is eventually thrown off; this is the *fall of the leaf*. But in some Endogens the articulation is so slight, and the stem increases so little in diameter, that the leaf is never thrown off, but simply withers and decays.

In all Exogens the leaf is thrown off sooner or later; but *Evergreens* retain their leaves for months, and the Araucaria, as well as some other Conifers, for many years.

292. The mode in which leaves are arranged within their bud is called *vernation*, or *gemmation* (247[a]).

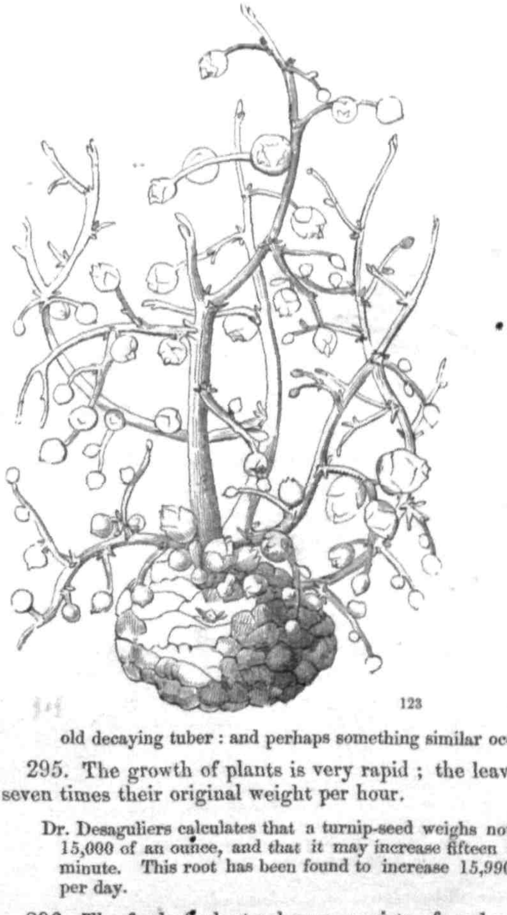
This is uniform in the same species, and sometimes different in allied species. It is therefore sometimes employed with advantage in distinguishing species, or even genera; but has been much less studied than its importance demands. The common varieties of vernation are represented at page 42.

293. Leaves have sometimes the property of producing leaf-buds from their margin; *Ex.* Bryophyllum, Malaxis paludosa, and proliferous Ferns.

IX.—OF FOOD AND SECRETIONS.

294. PLANTS are nourished by the absorption of food from the air and earth, in consequence of which they grow, and produce their peculiar secretions.

Sometimes they live for considerable periods upon what they find in the air only, and the organizable matter which they contain within themselves, as happens in Hyacinths and Potatoes, which will reproduce themselves, and form new branches and leaves without coming in contact with the earth. Epiphytes habitually live thus. Many accidental cases are also on record, one of the most remarkable of which is that of an ancient Apple-tree, which, in the year 1812, was uprooted by a storm, while loaded with fruit. Eight years afterwards it was still alive; it had formed a root at a knee of the stem on which it rested, had borne that year four bushels of fruit, and although sickly and overrun with moss, was in a way to recovery from the accident. Potatoes left in dry boxes, and forgotten there, will produce branches and young potatoes, as is shown in the annexed cut [123], and if light is admitted to them, will fully develop *their leaves, without any* communication with the earth. In such cases the soil is represented by the old decaying tuber: and perhaps something similar occurs in other cases.



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295. The growth of plants is very rapid; the leaves often acquire six or seven times their original weight per hour.

Dr. Desaguliers calculates that a turnip-seed weighs not more than the 14,000 or 15,000 of an ounce, and that it may increase fifteen times its own weight in a minute. This root has been found to increase 15,990 times the original weight per day.

296. The food of plants always consists of carbonic acid, nitrogen, and water, with various mineral matters, chiefly alkaline, the nature of which varies according to species.

297. The exact nature of their inorganic food, and the proportion which

they demand, is determined by what they contain. If a plant always contains a notable quantity of sulphur, we must suppose that mineral to be essential to it ; and so on.

This will be more clear if the following table of the analysis of the ashes of the stems of various plants be carefully examined :—

—	Wheat.	Barley.	Maize.	Buckwheat.	Flax.	Beans.	Potato.	Cabbage.
Potash . .	20	180	189	332	} 510	1656	138	2370
Soda . . .	29	48	4	62		50	0 ?	1154
Lime . . .	240	554	652	704	230	624	2928	1747
Magnesia . . .	32	76	236	1292	480	209	488	22
Alumina . .	90	146	6	26	2	10	52	17
Silica . . .	2870	3856	2708	140	20	220	801	210
Oxide of iron . .	—	14	4	15	10	7	58	8
Oxide of manganese	—	20	20	32	—	—	44	—
Sulphuric acid . .	37	118	106	217	66	34	245	959
Phosphoric acid .	170	160	54	288	118	226	32	785
Chlorine . .	30	70	6	95	20	80	0 ?	274
100,000 parts dry, yield, of ashes .	3518	5242	3985	3203	1456	3121	4786	7546

If these tables, taken from Professor Solly's Rural Chemistry, are to be relied upon, they show conclusively : 1. that the ordinary food of plants in part consists of the mineral matters here enumerated ; and 2. that their mineral matters vary in importance with species; for example, that Silica is of the first consequence to Wheat, Barley, and Maize ; Lime to Potatoes; Potash to Cabbage ; Magnesia to Buckwheat. On the other hand, that Chlorine, with Sulphuric and Phosphoric acids, which form a considerable ingredient in Cabbages, are of little moment in Wheat. Such facts are at the foundation of all husbandry, empirical as well as scientific.

298. Roots have the power of absorbing most substances in a fluid or gaseous form, even although their extremities are unbroken.

It appears probable that when plants are incapable of imbibing certain substances, such as strontian, there is no isomorphism between their ordinary mineral constituents and those they reject. Thus, lime and magnesia, which plants will indifferently absorb, are isomorphous ; but between them and strontian, which they will not absorb, no isomorphism exists.—*Daubeny.*

299. Roots possess the power of selecting from the food which is presented to their roots, such matters as are best suited to their constitutions.

This is the foundation of the whole practice of the rotation of crops. An endeavour has been made indeed to explain the necessity of that practice by the theory of root excretions (325), and Bouchardat denies altogether that plants possess any power of selection. But when we find that a *Wheat* plant, growing in the same soil, under the very same circumstances as a *Pea*, contains 2870 of silica, while the latter has only 1000, that the *Pea* has 2730 of lime against 240 in *Wheat*, and that such differences are universal among plants, reason tells us that experiments like those of M. Bouchardat are not satisfactory. It is, however, remarkable that plants should have no power of rejecting poisons.

300. *Carbon* is obtained by plants in the form of carbonic acid, derived from the atmosphere, or generated in soil by the decay of vegetable matter.

According to Schleiden, it is only decomposed in the presence of nitrogen.

301. *Hydrogen* is obtained principally by the decomposition of water, but also from sulphuretted hydrogen, or hydrocarbons, and is assimilated along with carbon, while the oxygen of the water, or of carbonic acid, is liberated

302. *Nitrogen* can only be obtained by plants in the form of ammonia. The nitrogen of the atmosphere, it is said, cannot be the source of supply, because it does not enter into combination with any element except oxygen, even when the most powerful chemical means are employed.

Mr. Rigg insists, however, that plants do obtain free nitrogen from the air ; and it must be admitted that the assertion of there being a chemical impossibility in the matter is of no weight ; for who shall say what is possible to that organised body which can decompose carbonic acid ?

303. Ammonia exists in every part of plants, in the roots, in the stem, and in all blossoms and fruits in an unripe condition. It is supplied by rain-water, which carries it down from the air, in which it is suspended, in consequence of the putrefaction of animal and vegetable matters.

304. A certain portion of the ammonia which falls with rain evaporates again with the water ; but another portion is taken up by the roots of plants, and, entering into new combinations, produces albumen, gluten, and a number of other compounds, containing nitrogen.

305. But it is not so much the quantity of ammonia that is important to plants, as the form in which it is presented to them. When in a volatile state, it is in great measure lost before it can be taken up. When fixed, in the state of salts, its volatility is overcome, and not the smallest portion of the ammonia is lost to the plants, for it is all dissolved by water and imbibed by the roots.

Hence the great importance of *fixing ammonia*, by converting the volatile carbonate into a fixed salt, such as the muriate, sulphate, or nitrate.

306. Nitrogen is chiefly found in the young parts and in seeds. It gradually disappears in old parts.

This is supposed to explain why young wood rots so much quicker than old wood ; and it is said that if the azotised matter of young wood (which is always soluble) is removed by repeated washings, it ceases to be perishable. Rigg says that Peas and Beans contain 200 parts by weight for every 1000 parts of carbon.

307. Carbonic acid, water, and ammonia, are not the only elements necessary for the support of vegetables. Certain mineral constituents are also essential.

308. *Phosphate* of magnesia in combination with ammonia is an invariable constituent of the seeds of all kinds of grasses. The *acids* formed in plants are of various kinds. It cannot be supposed that their presence and peculiarity are the result of accident. If these acids are constantly present and necessary to life, it is equally certain that some *alkaline base* is also indispensable, in order to enter into combination with the acids, which are usually found in the state of salts. (Raphides 90.)

309. If a plant does not produce more of its peculiar acids than it requires for its own existence, a plant must contain an invariable quantity of alkaline bases, wherewith the vegetable acids may form salts.

310. The proportion of alkaline bases in a plant is indicated by the quantity of ashes they yield. The quantity of ashes obtained from the same quantity of vegetable matter varies constantly in different species. Therefore the proportion of alkaline bases varies in different species, and consequently different species demand a different amount of alkaline food in the soil. (297.)

There is sometimes a great uniformity in the quantity of ashes found in the same plant. Professor Edward Solly found the following quantities in certain Rhubarbs:—viz. *Rheum undulatum*, 67 in 10,000 fresh; *hybridum*, 68; *crispum*, 61; *tataricum*, 78; *Myatts*, 62; in *Asparagus* of 1843 from the Horticultural Gardens, 700 in 10,000; and in that of 1842, from Covent Garden, 705.

311. The absolute quantity of mineral matter appears to be connected with the amount of nitrogen, but not the relative quantity.

Thus Professor Solly found but 19 parts of ashes in 10,000 of good fir-wood; but 318 in 10,000 when it was rotting; that is to say, when the quantity of nitrogen in it gave it a tendency to decay. In like manner the green parts of plants richest in nitrogen are richest in mineral matters. Thus, while timber of oak or deal does not at the worst exceed 320 in 10,000, the leaves of Kidney Beans contain 2995, of Chervil 2393, of Celery 2044, &c., as appears from experiments by the same expert analyst.

312. The perfect development of a plant is therefore dependent on the presence of suitable mineral matters; for when those substances are totally wanting, growth will be arrested; and when they are deficient, it must be impeded in proportion.

For example, corn-plants cannot grow in the absence of silica, and their vigour is, *cæteris paribus*, regulated by its abundance.

313. But other substances are required to sustain the life of plants. *Phosphoric* and *sulphuric acids* have been found in the ashes of all plants hitherto examined; and *common salt, sulphate of potash, nitrate of potash, salts of iron* and *copper, chloride of potassium*, and other matters, may be regarded as necessary constituents of several plants.

314. Therefore it is indispensable that every plant should find in the soil in which it grows those inorganic constituents which nature has rendered necessary to it, just as it is necessary for animals that they should find in their food the phosphates of lime and magnesia, which harden their bones.

315. As soon as food is absorbed, it begins to ascend into the stem, or to diffuse itself through the system, and receives the name of *sap*.

"Lac niveum potes purpureamque *sapam*."—Ovid.

316. In the course of the sap upwards, water and carbonic acid are partially decomposed, and their elements are deposited along with nitrogen in the interior of the tissue, forming the protoplasm (68) or layer over the interior of every cell and vessel, which thus become in part solidified.

317. As soon as the sap reaches the leaves or the surface of the bark, water is rapidly thrown off, and green matter, or occasionally some other colour, is formed, provided the part is exposed to LIGHT.

The connection between the appearance of green colour and light is sufficiently proved by blanched vegetables, which gain their verdure as soon as light is allowed to reach them. If some, as Rhubarb, acquire a colour notwithstanding their growth in absolute darkness, that is owing to the presence of soluble colouring matter ready formed in the fleshy roots from which the blanched shoots proceed.

The loss of water by plants seems to depend mainly (not entirely) upon the intensity of light to which they are exposed. In bright sunshine they perspire most, in weak diffused light least, and in darkness not at all.* Hales found that a Cabbage lost 19 ounces of its weight per diem, and a Sunflower 20; he estimated the average rate of perspiration by plants to be equal to 17 times that of a man. In one of his experiments he found that the branch of an Apple-tree, 2 feet long, with 20 apples on it, exposed to bright sunshine, raised a column of mercury

12 inches in 7 minutes. But a dry air, especially if in motion, also robs plants of their water, independently of light.

318. This appears to arise chiefly from the decomposition of carbonic acid, ammonia, and water, when the carbon, nitrogen, and hydrogen are fixed by the plant, and the oxygen restored to the atmosphere. Such action is called the *assimilating power* of plants.

Plants are, therefore, the great purifiers of the atmosphere, consuming the products of animal respiration and putrefaction, and converting them again into matter suited to the wants of man. According to the most recent and very accurate experiments of Mr. Haseldine Pepys, it seems proved that healthy vegetation is always so acting as to restore the atmospheric air to its original composition of 21 parts per cent. of oxygen, by the absorption of carbonic acid and liberation of oxygen ; that this action is accelerated by the aid of light, but that it continues during the night, although more slowly.

319. In the absence of light, plants re-absorb oxygen from the atmosphere, and re-combine it with the matter they contain, to be again liberated at the return of light.

320. They also, at all times, especially at night, part with carbonic acid in small quantities.

It has, however, been proved experimentally that they purify the air much more by their assimilating (318) action than they vitiate it by their respiration ; and Mr. Pepys was unable to find that any carbonic acid was produced so long as plants remain in health. But if a healthy growing shoot, loaded with leaves, be placed in lime-water, carbonate of lime is formed upon its surface, and it is difficult to believe that the mere separation of a shoot from its parent would suddenly give rise to the extrication of carbonic acid ; the inference would rather be that carbonic acid is habitually given off in respiration.

321. No plants can long exist in which this alternate action is prevented, unless, perhaps, Fungals and brown parasites.

322. The amount of assimilation is determined by the degree of light to which a plant is exposed. It is LIGHT alone that causes, in conjunction with vital force, the decomposition of the matters contained in living plants

The exact manner in which light acts upon plants has been studied by Dr. Daubeny and others, especially by Mr. Hunt, the result of whose inquiries is given thus in the *Gardener's Chronicle* of Aug. 16th, 1845. Assuming with Sir David Brewster that the prismatic spectrum consists of only three *primitive* colours, namely, red, yellow, and blue, it is ascertained by experiment that the maximum of HEATING POWER is found on the confines of the *red* rays ; that the largest amount of LIGHT is given by the *yellow* rays ; and that the CHEMICAL POWER exists most strongly amidst the *blue* rays of the spectrum. If we take a deep red glass, which has been coloured with oxide of gold, it will be found that the quantity of light which passes through it is very small ; and by the use of photographic paper it may be ascertained that the amount of that principle which produces chemical change is also very little ; whereas the heat-rays suffer no interruption. A deep yellow glass, or a cell filled to the thickness of an inch with a solution of bichromate of potash, intercepts almost entirely the chemical rays, but admits of the permeation of all the luminous rays, and offers but little interruption to the calorific. If, however, we cover a pane of this yellow glass with another of very pale green bottle-glass, the passage of the heating rays is much impeded. A deep blue glass, such as is used for finger-glasses, coloured with oxide of cobalt or a solution of oxide of copper in ammonia, has the property of admitting freely the passage of all the chemical rays, whilst it obstructs both the heat and light radiations. Experiments conducted with colours thus obtained led Mr. Hunt to the following conclusions :—

"1. *Light which has permeated* YELLOW *media :* LIGHT-RAYS.—In nearly all cases the germination of seeds was prevented, and even in the few cases where germi-

nation commenced, the *young plant* soon perished, and the germination appeared to be referrible to the action of the heat-rays, which had passed the medium employed, rather than to light. Agarics, and several varieties of Fungi, flourished luxuriantly under this influence. Although the luminous rays may be regarded as injurious to the early stages of vegetation, Mr. Hunt believes that, in the more advanced periods of growth, they become essential to the formation of woody fibre.

"2. *Light which has permeated* RED *media:* HEAT-RAYS.—Germination, if the seeds are very carefully watched, and a sufficient quantity of water is added to supply the deficiency of the increased evaporation, will take place here. The plant is not, however, of a healthy character, and, generally speaking, the leaves are partially blanched, showing that the production of chlorophyll is prevented. Most plants, instead of bending towards red light in the same manner as they do towards white light, bend from it in a very remarkable manner. Plants in a flowering condition may be preserved for a much longer time under the influence of red light than under any other, and Mr. Hunt thinks that red media are highly beneficial during the fruiting process.

"3. *Light which has permeated* BLUE *media:* CHEMICAL RAYS.—The rays thus separated from the heat and the light rays, and which Mr. Hunt has proposed to call ACTINIC, have the power of accelerating in a remarkable manner the germination of seeds, and the growth of the young plant. After a certain period, varying with nearly every plant upon which experiments have been made, these rays become too stimulating, and growth proceeds rapidly, without the necessary strength. The removal of the plant into yellow rays, or into light which has permeated an emerald green glass, accelerates the deposition of carbon, and the consequent formation of woody fibre. It was also found that, under concentrated actinic force, seeds will germinate at a depth beneath the soil at which they could not have grown under natural conditions. Mr. Hunt believes that the germination of seeds in the spring, the flowering of plants in summer, and the ripening of fruits in the autumn, is dependent upon the variations in the amount of actinism—or chemical influence—of light and of heat, in the solar beam at those seasons."

It must, however, be obvious, that, although such experiments have much physiological interest, their value is greatly diminished by the necessarily imperfect manner in which the prismatic colours are separated by artificial preparations. It is almost, if not quite, impossible to form *pure* colours artificially; the yellow for instance of bichromate of potash contains both red and violet in abundance.

323. Therefore, if a plant is compelled to grow in darkness, no assimilation takes place of the food that the roots receive; oxygen accumulates; its natural proportion to other elements is disarranged; and a destruction of the tissue ultimately takes place.

324. In order to avoid this, plants will always lengthen themselves in the direction in which the smallest ray of light approaches them, as in the case of seeds which shoot from darkness into light. If this is impossible, they become blanched or *etiolated*, and then die.

325. From the continued assimilation of the elementary constituents of plants, new products result, and serve for the formation of woody fibre, and all solid matters of a similar composition. The leaves produce the sugar, starch, and organic acids, which are necessary for the development of the stems, buds, leaves, and branches.

Some phyto-chemists believe that during the chemical transformations that result in plants from the separation and re-combination of their elements, two compounds are necessarily formed, one of which remains as a component part, while the other is separated by the roots, in the form of *excrementitious matter*. But the experiments upon which this supposition is founded are not conclusive; and great doubt is entertained whether plants have really a peculiar power of rejecting excrementitious matter by their roots. It appears more probable that the necessary separation of effete matter takes place principally by the hairs and glands that clothe the skin of plants, or by a fluid secretion from their whole surface.

326. The changes which the fluids of plants undergo beneath the foregoing influences, take place principally in leaves, or if they are absent, in the young bark, which is specially organised to supply the place of leaves.

327. Hence the great importance of leaves to plants, and the necessity of exposing them to the full influence of light and air, for the purpose of securing a due execution of their natural functions. Hence also the impropriety of mutilating plants by the destruction of their leaves.

It is not, however, to be understood that assimilation is dependent upon the mere *number* of leaves. Many small ill-formed leaves may be of less value to a plant than a few large healthy leaves. Secreting power is in proportion to the *area* of foliage, its *health*, and its proper *exposure to light and air*, especially to air in motion.

X.—OF THE MOTIONS OF FLUIDS.

328. It is obvious that since plants receive their food principally by their roots, and always, necessarily, by their surface, there must be a motion of their fluids analogous to that of the blood in animals.

329. Two kinds of motion have been observed in plants ; a *partial* and a *general*. They are essentially different.

330. The partial motion is also called that of *rotation*. It is confined to the interior of cells or tubes, and appears to be universal, at least in the earliest period of life.

331. Rotation consists in the trickling of globules along viscous threads which are all connected with the cytoblast ; and it may perhaps be regarded as a true circulation.

This is easily seen in such plants as Valisneria, and in many kinds of hairs, especially those of plants which contain a milky fluid (see p. 12, fig. 54), where the globules roll away, one after the other, much in the same way as the blood-corpuscles in reptiles. In other cases the motion is rather a matter of inference.

It is generally very irregular, being quick in one cell and slow in the next; is occasionally suspended, and then renewed with seeming velocity. Mohl has measured the rate of movement, and represents it to be, at a temperature of 66° to 68° Fahr., as follows :—

Tradescantia virginica . .	$\frac{1}{300}$ to $\frac{1}{900}$	Paris line in a second.	
Valisneria spiralis . . .	$\frac{1}{125}$ to $\frac{1}{600}$	"	"
Urtica baccifera . . .	$\frac{1}{625}$ to $\frac{1}{875}$	"	"
Sagittaria sagittifolia (rhizome)	$\frac{1}{725}$ to $\frac{1}{1056}$	"	"
Do. do. (leaf)	$\frac{1}{1170}$ to $\frac{1}{1360}$	"	"
Cucurbita Pepo . . .	$\frac{1}{770}$ to $\frac{1}{2760}$	"	"

He observes that the smallness of these numbers may surprise many when compared with the apparent velocity under the microscope ; but it must not be forgotten that in such observations the motion is seen quickened several hundred times.

In Charas[124] the motion is, on the contrary, very regular. It occurs in the cavity formed between a central sac and the cell wall, constantly rises up the side external to the axis, and descends on the side next the axis. If the cell be choked by a ligature, then it is said that each half has its proper motion. The rate of motion is reported not to exceed a line in half a minute.

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The cause of these motions is vitality. All attempts at referring it to known agency have failed. In Charas it has been referred to some action on the part of numerous green granules which are found in rows specially arranged on the cell wall. Amici regarded them as the elements of a voltaic pile ; but this has been disproved experimentally by Becquerel and Dutrochet, who conclude that the forces producing rotation cannot, to all appearance, be referred to electrical action, which in this plant takes place in a peculiar manner, of which we have no other example. Donné says the granules above alluded to have a power of spontaneous motion. 1. A parcel of granules separates from the rest, rolls up, and presents a rapid motion. 2. Single granules detach and turn rapidly on their own axis. 3. This motion is altogether independent of rotation, than which it is very much more rapid. 4. Some move—others do not : the motion is when the

granules lie in their own oily or albuminous fluid; the want of motion is when they are lying in water only. When the rows of granules are displaced, a circle is perhaps formed, thus and then it moves like a wheel, always in the same direction, "evidently spontaneously." The circle gives an impulse to the surrounding fluid, which impulse is communicated in return to the circle, which being moveable, is forced to revolve on its axis upon the same principle as a Catherine-wheel firework.

332. The *general* motion of fluids is that by which they are transferred from place to place in the whole structure of a plant.

333. It takes place from cell to cell by means of the perforations in the

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protoplasm (68); but from place to place through intercellular passages (21).

334. Its longitudinal transmission is principally effected by woody tissue (32); its horizontal, exclusively by cellular tissue (17).

335. In Exogens it rises by the woody tissue of the wood, falls by that of the bark, and moves horizontally through and among the cellular tissue

of the medullary system, that is to say, by the medullary plates and cortical integument or bark (181), where it is finally deposited.

Hence it is that the secretions of plants are to be found most abundantly in the cellular matter, (as is proved by the general use of barks in medicine,) or in the roots into which they necessarily settle by their own weight. It is also believed that the deep colour and the hardness peculiar to the heartwood of some Exogens, is owing to the gradual deposit in the centre of the trunk, of matter forced through the medullary rays from the circumference.

The old statement that sap rises exclusively by the alburnum (180) and falls by the liber (185), cannot be true; for if a tree is cut through in the spring, the whole surface of the wound is found to become moist, principally so, however, towards and among the alburnum. The truth appears to be, that it finds its way upwards through the tissue which is least clogged by the deposit of secretions, and that tissue is the alburnum. But it is proved by experiment that in some cases the alburnum refuses to allow the passage upwards of fluid, which the central tissue takes freely. This I have ascertained in the course of some experiments in charging living trees with the crude pyrolignite of iron by Boucherie's first process.

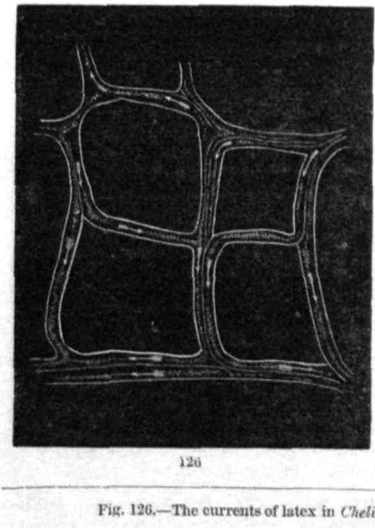
Neither is it indispensable that bark should be present in order to allow the passage of sap downwards, as is proved by trees whose bark has been accidentally destroyed, continuing to live for many years [120]. In such cases the supposition is, that the falling sap passes laterally into the medullary plates, and descends by them until it gets into communication with those which end in bark, when the usual channel of descent is resumed.

336. In Endogens sap probably rises by the woody tissue of each fibro-vascular bundle (200), and falls by the cellular system: but this is a matter of inference rather than of certainty.

337. The precise direction taken by the fluids of Acrogens has not been sufficiently investigated.

338. What has been called *Cyclosis*, and supposed to be a third kind of motion, is now known to be caused by wounding or pressing upon the vessels of latex (49), in which it has been seen.

In the common Celandine, *Chelidonium majus*, this is easily observed, or in the thin inner sepals of *Calystegia sepium*, &c. In some plants the cinenchyma [126] is seen to be filled with a milky fluid, red or yellow, in active motion, rising up one side of an arm, descending another, or passing up both sides at once in the same direction, and moving along the anastomoses peculiar to this sort of tissue. I long ago expressed a suspicion that this appearance was owing to the emptying of such tissue at the place where it is wounded; and this has now been confirmed by Mohl, who adds that it is also caused by the torsion and compression of the surrounding parts.



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339. This general motion, like that of rotation, must be regarded as a vital action, and cannot be explained by any external cause. It has been referred to the sucking

Fig. 126.—The currents of latex in *Chelidonium majus*, indicated by arrows.

action of leaves at one end of a plant, namely, in its buds or leaves, and to Endosmose* at the other, namely, at the roots ; and there can be no doubt that these two forces operate powerfully in assisting the vital action. It is well known indeed, that in the spring the fluids are always first in powerful motion next the leaf-buds, and that this phenomenon, called *the flow of the sap*, extends downwards till it reaches the roots. But Biot has demonstrated that the general motion of the fluids of plants is incessantly going on, although in winter it is so slow as not to be perceived ; yet in winter the leaf-buds are torpid. Neither will there be any movement in the fluids of a plant suddenly killed, although the physical state of its tissues is unaltered.

* Endosmose is that phenomenon which consists in the attraction by a dense fluid of a thinner fluid through an organic membrane ; as when sugar-water, being separated by a piece of bladder from pure water, attracts the latter through the bladder. It is evidently a very important force, continually in play in plants, but quite subordinate to vitality, and only co-existent with it.

XI.—OF THE FLOWER-BUD.

340. The Flower-bud consists of a fixed cellular central point, surrounded by imbricated, rudimentary leaves, the external or inferior of which are usually alternate, and the internal or superior verticillate, or opposite.

In the beginning it differs from the leaf-bud in nothing more than the absence of all power of extension in the central cellular tissue, which is in that respect, and in no other, different from the *growing point* of the leaf-bud. Accidental circumstances cause it to lose its fixed and to assume the growing quality, in which case flower-buds become leaf-buds, as is shown by the conversion of flowers into branches [127].

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341. The rudimentary leaves, under ordinary circumstances, acquire peculiar forms, assume peculiar colours, are rolled up contracted or changed, and unite with each other in various ways, and thus form what are called *floral envelopes* (392) and *sexes*. Under extraordinary circumstances, and the influence of disturbing causes, they grow into leaves of the usual nature.

Linnæus taught, and Goethe proved, that all flowers are but arrangements of altered leaves. The one thought that their birth was anticipated in order to obtain the means of building up the blossom; the other demonstrated that although the fanciful doctrine of anticipation was unsupported by evidence, yet that the blossom was really formed, in all its parts, by leaves in what we might call a nascent state. The most exact and careful observation of the successive development of these parts, shows the doctrine to be strictly true in every particular. In the absence of such demonstration, a case mentioned in the *Gardeners' Chronicle* would be conclusive. A rose was found in the following state [128]:—the calyx tube was absorbed, or at least not manifest, the sepals were half converted into leaves, the petals more than half changed into sepals, the stamens had fallen off, but appeared to have undergone little change; the exterior carpels were partly in their customary state; those nearer the centre were converted into small leaves; but the remainder upon the axis or centre, which had lengthened into a branch, were carried up in every conceivable state of transition, until the last carpels, that is to say, the uppermost, assumed the customary appearance of the leaves of the stem.

342. Every flower-bud proceeds from the axil of a leaf, either fully developed or rudimentary, and therefore occupies exactly the same position with respect to the leaf as a leaf-bud.

343. The leaf from the axil of which a flower-bud arises, is called a ***bract*** or ***floral-leaf***; and all rudimentary leaves, of what size or colour soever,

Fig. 127.—Flowers of *Epacris impressa* changing into branches.

which appear on the peduncle (353) between the floral-leaf and the calyx (395), are called *bracteolæ* or *bractlets.*

In common language, botanists constantly confound these two kinds, which are, nevertheless, essentially distinct. They readily assume the appearance of common leaves [129].

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344. Although the buds in the axils of bracts are often not developed, yet they have the same power of development as those in the axils of leaves; they are generally flower-buds, very rarely leaf-buds.

This is manifested in the proliferous flowers which are of the nature of the "Hen and Chicken" Daisy.

345. When a single bract is rolled together, highly developed, and coloured, and is placed at the base of that form of inflorescence called a spadix (374), it is named *spathe*; *Ex.* Arum.

This term is extended to all bracts of large size, which cover over many flowers.

346. When several bracts are verticillate or densely imbricated around the base of those forms of inflorescence which are called the umbel or capitulum (376), they receive the name of *involucre ; Ex.* Carrot, Daisy.

347. When the bracts of an involucre form a single whorl, and cohere by their margins, it is impossible to distinguish them from the calyx by any other mark than by their position, or by their surrounding more flowers than one.

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348. The minute or colourless bracts at the base of the florets of a capitulum (377) are called *paleæ*.

349. Small imbricated bracts are often called *scales*.

350. Bracts, when placed immediately below the sexes, as in apetalous flowers, are only distinguished from the calyx by being on one side of the sex, or alternate with each other, and not verticillate ; hence the *glumes* and *paleæ* of grasses are bracts and not calyx.

351. Bracts appear to be intended by nature as protecting organs, within or beneath which the young flowers are secured in their tender state.

352. The axis of the flower-bud in its natural state does not lengthen beyond those upper series of metamorphosed leaves which constitute the sexes.

Nevertheless, as it is the growing point in a quasi-paralysed state, it may lengthen if the paralysis is removed, as has just been shown (340); and as is further proved by those fruits from whose centre a branch or branches appear [130]. In such cases the fixed central point merely becomes a growing point.

353. The lengthened part of the axis, from the point of its connection with the stem as far as the floral envelopes, is called the *peduncle*.

354. When several peduncles spring from the axis at short distances from each other, the axis receives the name of *rachis*, and the peduncles themselves are called *pedicels*.

355. There is never more than one flower to each peduncle, strictly speaking ; therefore, when we speak of a two-flowered peduncle, we only

mean that two flowers, each having its peculiar pedicel, terminate the axis, which is then considered a peduncle common to each pedicel.

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356. Every flower, with its peduncle and bractlets, being the development of a flower-bud, and flower-buds being altogether analogous to leaf-buds, it follows, as a corollary, that every flower, with its peduncle and bractlets, is a metamorphosed branch.

357. And further, the flowers being abortive branches, whatever are the laws of the arrangement of branches with respect to each other, the same will be the laws of the arrangement of flowers with respect to each other.

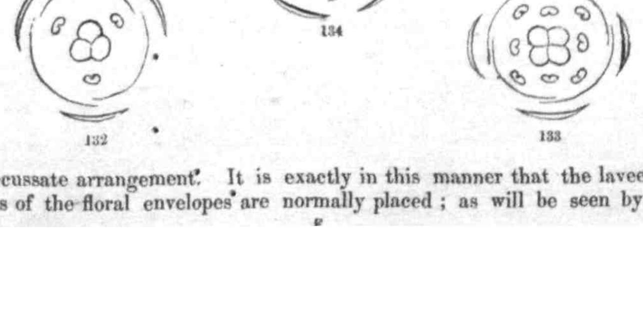
358. Flower-buds, however, being much less subject to abortion than leaf-buds, flowers are more symmetrically disposed than branches, and appear to possess their own peculiar order of developement.

359. As flower-buds can only develope from the axil of a bract, it follows, that while a pedicel without bracts can never accidentally produce other flowers, any one-flowered pedicel, on which bracts are present, can, and frequently does, bear several flowers.

It is, however, remarkable that in the Cruciferous order (V. K. p. 351), the bracts are generally abortive.

360. In consequence of a flower and its peduncle being a branch in a particular state, the rudimentary or metamorphosed leaves which constitute bracts, floral envelopes, and sexes, are subject to exactly the same laws of arrangement as regularly formed leaves.

361. When leaves are opposite on a branch, those of each pair or whorl alternate with those of the succeeding pair or branch, forming what is called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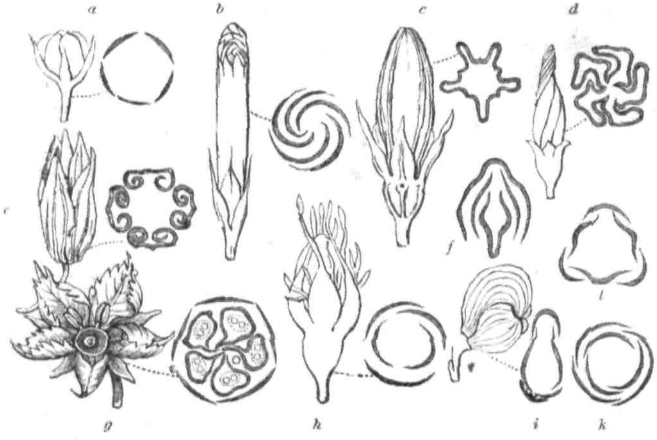
a decussate arrangement. It is exactly in this manner that the lavees or parts of the floral envelopes are normally placed; as will be seen by the

foregoing diagrams, in which organ is placed within organ alternately, with the most exact symmetry, whether the flower be *dimerous* [131], *trimerous* [132], *tetramerous* [133], or *pentamerous* [134].

362. The manner in which the floral organs, especially the calyx and corolla, are arranged before expansion takes place, is called the *æstivation* or *præfloration*.

The following are the principal kinds of æstivation :—valvate [a] ; valvate and involute [g] ; imbricate [h] ; alternate [k l] ; convolute [b] ; induplicate [e] ; plicative [c] ; quincuncial [h i] ; supervolutive [d] ; vexillary [f].



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363. The modes in which the flower-buds are arranged are called *forms of inflorescence* ; and the order in which they unfold is called the *order of expansion*.

XII.—OF THE INFLORESCENCE.

364. INFLORESCENCE is the ramification of that part of the plant intended for reproduction by seed [139, 140, 141].

365. The greater development of some forms of inflorescence than of others, is owing to the greater power one plant possesses than another of developing buds, latent in the axils of bracts (343).

366. In consequence of flower-buds obeying the laws which regulate the position of leaf-buds, all forms of inflorescence must, of necessity, be axillary to a leaf of some kind.

367. Those forms which are called *opposite the leaves, extra-axillary, petiolar* or *epiphyllous*, and even the *terminal* itself, are mere modifications of the axillary.

According to this theory, the inflorescence, which is opposite [136] to one leaf, really belongs to the leaf next like it ; the extra-axillary is a diminished form of the

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latter ; the petiolar is caused by the peduncle and petiole becoming adherent ; the epiphyllous [137] is an exaggeration of the latter ; and the terminal belongs to the last leaf on the branch. None of these are to be confounded with the appear-

ance of flowers on the edge of leafy branches[138], which is really the ordinary axillary condition, the notches on the margin of such branches being nodes, and the scales belonging to the notches bracts.

368. The kinds of inflorescence which botanists more particularly distinguish are the following :—

369. When no elongation of the general axis of a plant takes place beyond the development of a flower-bud, the flower becomes what is called *terminal* and *solitary* ; *Ex.* Pæony.

370. When a single flower-bud unfolds in the axil of a leaf, and the general axis continues to lengthen, and the leaf undergoes no sensible diminution of size, the flower which is developed is said to be *solitary* and *axillary*.

371. If all the buds of a newly formed elongated branch develope as flower-buds, and at the same time produce peduncles, a *raceme* is formed [b].

372. If buds, under the same circumstances, develope without forming peduncles, a *spike* is produced [a].

373. Hence the only difference between a spike and raceme is, that in the former the flowers are sessile, and in the latter stalked.

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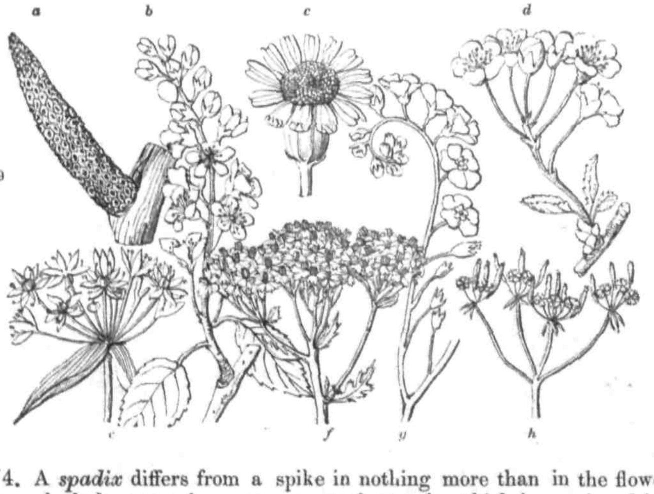

374. A *spadix* differs from a spike in nothing more than in the flowers being packed close together upon a succulent axis, which is enveloped in a spathe (345).

375. An *amentum* is a unisexual spike the bracts of which are all of equal size, and closely imbricated, and which is articulated with the stem.

376. When a bud produces flower-buds, with little elongation of its own axis, either a *capitulum* [i k], or an *umbel* [h], is produced.

377. The capitulum bears the same relation to the umbel as the spike to the raceme ; that is to say, these two forms differ in the flower-buds of the capitulum being sessile, and of the umbel having pedicels (354).

378. The dilated depressed axis of the capitulum is called the *receptacle*.

379. A raceme, or panicle, the lowest flowers of which have long pedicels, and the uppermost short ones, is a *corymb* [d f].

380. A *panicle* is a raceme, the flower-buds of which have, in elongating, developed other flower-buds.[l]

381. A panicle, the middle branches of which are longer than those of the base or apex, is called a *thyrse*.

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382. A panicle, the elongation of all the ramifications of which is arrested, so that it assumes the appearance of an umbel, is called a *cyme* [m].

The accompanying figure represents the order of formation of a regular cyme, as it occurs in Erythraea Centaurium [141], a' represents the first axis, from which all the branches proceed, and f' the first flower; a' gives birth to a'' and a'', which are terminated by f'', or secondary flowers, and so on. In this form of inflorescence the principal axis of growth is incessantly stopped, and growth is as incessantly renewed by the development of after-branches from the axils of the lateral bracts belonging to the flower of the principal axis.

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383. In all modes of inflorescence which proceed from the buds of a single branch, the axis of which is either elongated or not, the flowers expand first at the base of the inflorescence, and last at the summit. This kind of expansion is called *centripetal*.

384. When the uppermost or central flowers open first, and those at the base or the circumference last, the expansion is called *centrifugal*.

385. The centrifugal order of expansion always indicates that the inflorescence proceeds from the development of the buds of several branches.

386. When inflorescence is the result of the development of several branches, each particular branch follows the centripetal law of expansion, but thewhole mass of inflorescence the centrifugal.

387. This arises from the partial centripetal development commencing among the upper extremities of the inflorescence, instead of among the lower.

388. Consequently, this difference of expansion will indicate whether a

particular form of inflorescence proceeds from the development of the buds of a single branch, when it is called *simple*, or not, when it is called *compound*.

389. Whenever the order of expansion is centripetal, the inflorescence is to be understood as simple; when it is centrifugal, it is compound, although in appearance simple. This difference is often of importance.

390. When the order of expansion is irregular, it indicates that the mode of development of the flowers is irregular also, either on account of abortion or other causes.

391. Sometimes all the flowers of the inflorescence are abortive, and the ramifications, or the axis itself, assume a twisted or spiral direction; when this happens, a *tendril* is formed; *Ex.* the Vine.

XIII.—OF THE FLORAL ENVELOPES.

392. THE Floral Envelopes are the parts which immediately surround the sexual organs.

393. They are formed of one or more whorls of bracts, and are therefore modified leaves (343).

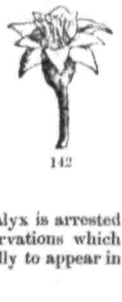
394. In anatomical structure they do not essentially differ from the leaves, farther than is necessarily consequent upon the peculiar modifications of size or development to which they are subject.

395. When the floral envelopes consist of but one whorl of leaves, they are called *calyx*.

396. When two or more whorls are developed, the outer is called calyx, the inner *corolla*.

397. There is no other essential difference between the calyx and corolla. Therefore, when a plant has but one floral envelope, that one is calyx, whatever may be its colour or degree of development.

That there is no other difference between them than one of development, is curiously shown by what is called the Apetalous Apple, in which the petals never grow beyond the condition of the sepals [142].



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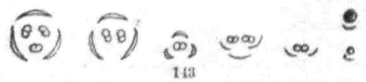
398. It is necessary, however, to be aware, that sometimes the calyx is reduced to a mere rim, either in consequence of lateral compression, as in the *pappus* (*aigrette*, Fr.) of many Composites, or from other unknown causes, as in some Acanthads.

It may be assumed, perhaps, that in these cases the growth of the calyx is arrested before its component parts have time to separate; for the observations which have been made upon Organogenesis, show the floral organs usually to appear in the form of a ring or cup, and to divide afterwards.

399. If the floral envelopes are of such a nature that it is not obvious whether they consist of both calyx and corolla, or of calyx only, they receive the name of *perianth* or *perigone*.

400. Plants have frequently no floral envelopes; in that case flowers are said to be *naked* or *achlamydeous*.



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There is in reality every degree of complication between flowers consisting of a great number and variety of parts, and the absence of everything excepting bracts and sexes. The accompanying diagram is given by M. Adr. de Jussieu, for the purpose of exemplifying this sort of *degradation*; that on the left hand showing a flower with 3 sepals and 3 stamens, those on the right a single bract and stamen or carpel.

401. When the floral envelopes are deciduous, they fall from the peduncle, as leaves from a branch, by means of an articulation; if they are persistent, it is because no articulation exists.

402. When the margins of floral envelopes are united, the part where the union has taken place is called the *tube*, and that where they are sepa-

or less degree, when it is called *monosepalous*, *gamosepalous*, or *monophyllous* 149.

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Observation shows that these organs always make their earliest appearance in the form of a shallow ring, upon which the elevations which become sepals, &c., gradually show themselves. *This ring must be regarded as a mere fold of the growing point*, and not as a simple organ liable to undergo some process of division at a late period.

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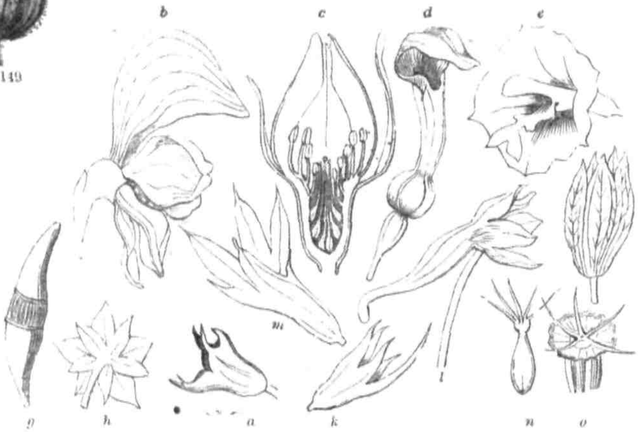

The calyx may be superior[d], or inferior[c]; galeate[b]; calyptrate[g], double[h]; calcarate[l]; coroniform[n, o]; vesicate[p]; dilated[e]; spiny[m]; oblique[k]; ringent[a].

406. The *corolla* consists of two or more divisions, called *petals*, usually of some bright colour, different from that of the sepals, than which they are frequently more developed. When the petals are distinct, a corolla is said to be *polypetalous;* when they are united by their margins, it is called *gamopetalous* or *monopetalous*.

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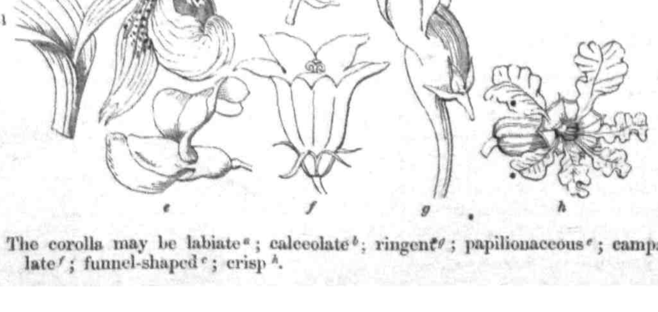

The corolla may be labiate[a]; calceolate[b]; ringent[g]; papilionaceous[e]; campanulate[f]; funnel-shaped[c]; crisp[h].

Although it presents less obvious resemblance to leaves than sepals, yet it is shown conclusively, by its frequent conversion into such organs, to have really the same leafy origin as the calyx, and especially by the curious fact, that the corolla, as a corolla, retains the power of forming leaf-buds in the axil of its petals [153], one of the attributes most peculiar to leaves (237).

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407. If the union of the petals or sepals takes place in one or two parcels, the corolla or calyx is said to be *one or two-lipped*. These lips are always anterior and posterior with respect to the axis of inflorescence, and never right and left.

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408. If the sepals or petals are of unequal *size*, or unite in unequal degrees, the calyx or corolla is said to be *irregular*[152].

409. If the sepals and petals are unequal in *number*, or no multiple of each other, or if the stamens are neither equal to them in number, nor any power of them, a flower is said to be *unsymmetrical*.

In their normal state all flowers are symmetrical. They cease to be so by the abortion of some of their organs. In common parlance the symmetry of a flower is regarded as complete if the number of sepals, petals, and stamens correspond. Thus Nightshades are called symmetrical, although they have a dimerous ovary while the surrounding parts are all pentamerous (361).

410. When the petals are so arranged, that out of five the uppermost is dilated, the two lateral ones contracted and parallel with each other, and the two lower also contracted, parallel with each other, and coherent by their anterior margins, a flower is said to be *papilionaceous*[151 e].

411. When a petal tapers conspicuously towards the base, it is said to be *unguiculate*[151 d]; its lower part is called the *unguis*, its upper the *limb*. The former is analogous to the petiole, the latter to the lamina of a leaf.

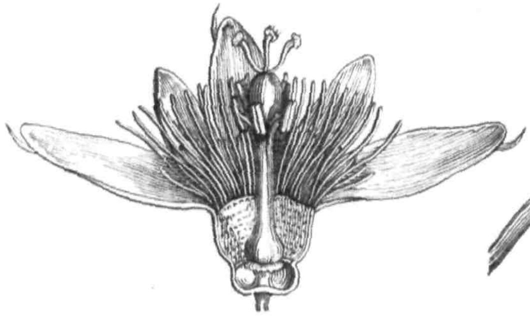
412. The petals always alternate with the sepals, a necessary consequence of their following the laws of development of leaves (361).

413. If at any time the petals arise from before the sepals, such a circumstance is due to the abortion of one whorl of petals between the sepals and those petals which are actually developed.

Some French Morphologists are of opinion that this rule is not general, and that when petals stand in front of sepals, &c., the circumstance is owing to an *unlining* process (*dédoublement*) one organ splitting into two plates. "When," says M. Auguste de St. Hilaire, "in a place, where, accordi... metry, we ought to find but one organ, we find sever... case as one of unlining. Multiplication repeat... the stamens belongs their alternation; unlining repeats the single corolla; of which nature are · But if this be so, we must assume that ... two different plans: which is cont...

Of this nature are the horn-like bodies found beneath the upper galeate sepal of Aconitum [159], the coronet of Narcissus [155 b], a part of the coronal appendages or coronet of Stapelia [155 a c d].

416. But it is to be observed, that as there are no exact limits between the corolla and the stamens (418); such bodies as have been just described are often of an *indifferent* nature, and may be referred with equal justice to petals passing into stamens, and to stamens passing into petals.



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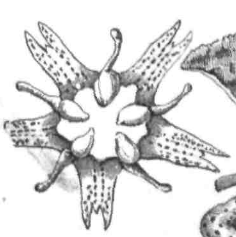
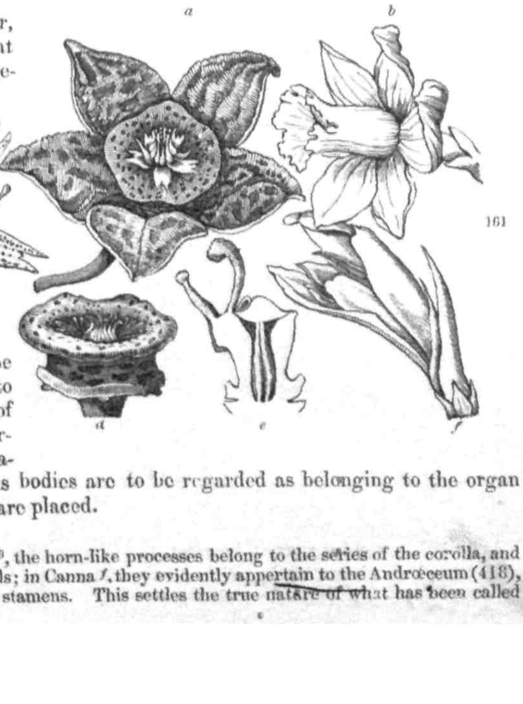
This is particularly the case with some parts of the coronet of Stapelia [161 d], and the long rays of the Passion-flower [160].

417. If, however, anomalous bodies at this part of the vegetable system can be shown to belong to any whorl or series, of which a part is certainly petals or stamens, such anomalous bodies are to be regarded as belonging to the organ in whose series they are placed.





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Thus in Aconitum [159], the horn-like processes belong to the series of the corolla, and are therefore petals; in Canna [f], they evidently appertain to the Andrœceum (418), and are therefore stamens. This settles the true nature of what has been called

the nectary [162], in Orchids now termed the lip, or labellum, which, forming a part of the second series of floral envelopes, is therefore universally recognised as a petal, notwithstanding its singular form.

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The term nectary is now generally abandoned, on account of the vagueness of its application; or, if preserved, is confined to parts secreting honey. A modern French botanist, M. L. Bravais, in a paper published in the *Annales des Sciences*, 2nd series, vol. xviii. p. 152, maintains that this secreting apparatus is much more generally present in flowers than is supposed, but is chiefly confined to the andrœceum (418). His words are these :—" The nectar-bearing parts exist in a determinate place of the floral apparatus, *rarely on the calyx or pistil*, generally on some part of the andrœceum. The examination of a great number of flowers has revealed the existence of separate nectaries or disks on most of them, and in places which vary with the order or genus. In each leaf of the andrœceum (that is to say, in each stamen or its equivalent) we must distinguish four parts, which, reckoning from below upwards, are—1, the stalk; 2, the nectary; 3, the anther; 4, the limb. It is seldom that all these parts are present at the same time; usually there is only three, or two, or one only; or they are abortive on certain plants of the same genus or order, although other species have them. In the petal these parts appear at the base, in the form of a point of insertion, paler than the rest of the corolla; then follows a cavity or nectar-bearing surface, terminated by two plates or marks, corresponding to the cells of an anther; and finally a membranous zone, or limb of more or less brilliancy. In a stamen we have the stalk, then a filament which carries secreting hairs or glands, or a nectariferous horn; above are the two cells of pollen, and higher still is the limb: petaloid in Borage, the Violet, &c., or subulate in the Asarum or Paris." Similar parts are made out by M. Bravais, in the carpel. He adds, that the honey is sometimes secreted before the discharge of pollen, always accompanies it, is often visible after pollen and anthers have disappeared, in some cases is re-absorbed, and probably assists in the nutrition of ovules. (See 466).

XIV.—OF THE STAMENS.

418. The organs immediately within the petals, are bodies called *stamens*, which are considered the male apparatus of plants, and constitute the *Andrœceum*.

419. They consist of a bundle of spiral vessels surrounded by cellular tissue, called the *filament*[163 b], terminated by a cellular case, finally opening and discharging its contents, called the *anther*[163 a].

420. There are many instances in which no limits can be traced between the petals and stamens; *Ex.* Nymphæa.

421. In such cases it is found that the limb (411) of the petal is undeveloped, and becomes an anther, while the unguis assumes the state of a filament.

422. Now as there are no limits between petals and sepals (397), nor between sepals and bracts (393), nor between bracts and leaves (343), it follows that the stamens are also modifications of leaves.

423. And as the limb of a petal is analogous to the lamina, and the unguis (411) to the petiole of a leaf, it also follows that the anther is a modification of the lamina, and the filament of the petiole.

This is moreover proved to be true, by the occasional developement of stamens beyond their due limits, when they assume the colour, form, and structure of leaves without shifting their position.

424. The stamens follow the same laws of successive development as leaves (361); and, consequently, if their arrangement be normal, they will be either equal in number to the petals, and alternate with them, or, if more numerous, some regular multiple of the petals.

425. If they are twice the number of petals, two whorls are considered to be developed; and so on.

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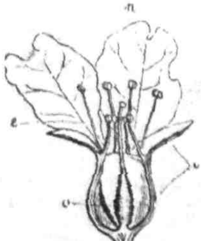
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426. If they are equal in number to the petals, and opposite them, it is to be understood that the innermost only of two whorls is developed, the outermost being abortive; *Ex.* Rhamnads.

427. All deviations from these laws are owing to the abortion of some of the stamens; *Ex.* Lamium, Hippuris (413).

428. When the stamens do not contract any union with the sides of the calyx, they are *hypogynous*[167 169 k]; *Ex.* Ranunculus, Geranium.

429. When they contract adhesion with the sides of the calyx, they become *perigynous*; *Ex.* Almond[164], Rose.

430. If they are united both with the surface of the calyx and of the ovary, they are *epigynous*; *Ex.* Umbellifers.

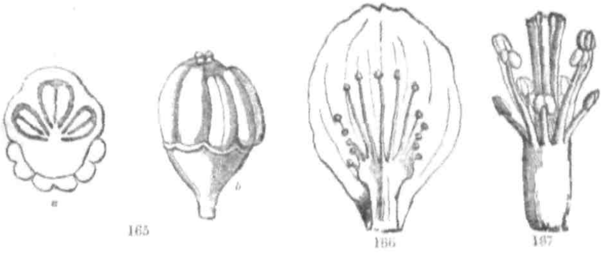
A curious example of an epigynous structure, quite different from those of usual occurrence, is related by Mr. Gardner in the *Gardeners' Chronicle*. In a species of Glochidion[165] he found a solitary flower containing 3 anthers growing by the

back to a 3-celled ovary; but a comparison of the customary structure of the species showed this to be a monster in which 3 cells of a six-celled ovary were developed in the form of anthers. This adds a striking instance to others previously known of the convertibility of all the organs of a flower, and consequently of their common nature being the same in the beginning.

431. When two are long and two are short [169 i], they are called *didynamous;* and if out of six two opposite ones are shorter than the other four, they are *tetradynamous*.

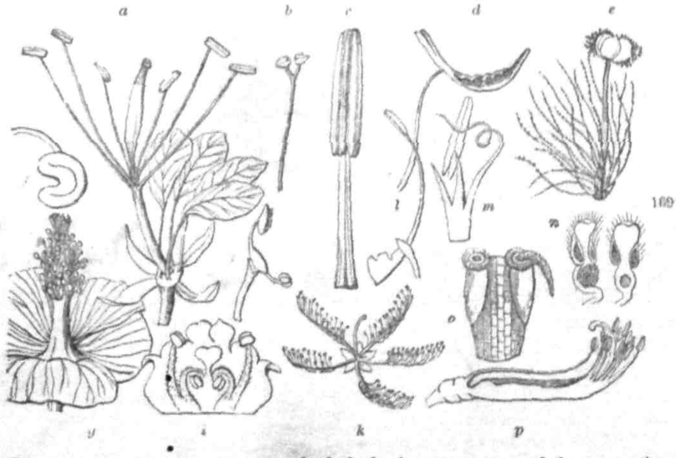
432. Stamens whose anthers are missing or imperfect, are called *abortive*.

They assume various unusual appearances; in Scrophularia [169 i] there is but one, and it is much broader than the perfect stamens; in Parnassia [166] they unite into



a fringed body, having all its points tipped with a gland; in other cases they resemble petals, &c.

433. The *filaments* (419) are either distinct or united by their margins. If they are united in one tube, they are called *monadelphous* [167 169 g]; *Ex.* Malva: if in two parcels, *diadelphous* [169 p]; *Ex.* Pea: if in several, *polyadelphous* [169 k]; *Ex.* Hypericum.



Filaments are sometimes apparently forked [b], in consequence of the separation of the connective (439) into two arms; strumose, when a tubercle forms upon their face [n]; stupose, if covered with long hairs [e]; and toothed [m], if their margin is lengthened on either side beyond the attachment of the anther.

434. When they are united in a solid body, along with the style, they form what is called a *column*, and are said to be *gynandrous* [162].

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435. They are often unequal in length or size, in which case the differences usually depend upon the presence of several rings of stamens, differing in degrees of development [167]. Inequality in the size of stamens of the same ring is generally connected with irregularity on the part of the calyx or corolla [169 i].

436. Occasionally the bark of the filament is extended into a lobe; *Ex.* Borage [168].

437. The filament is not essential to a stamen, and is often absent.

438. The *anther* [163 a] is the limb of the stamen, forming within its substance, and finally emitting, a matter called *pollen*.

439. The two sides of the anther are its *lobes;* and the solid substance which connects them, and which is in fact a continuation of the filament, as the midrib of a leaf is of the petiole, is named the *connective*.

440. The connective is usually simple and uninterrupted; but it is sometimes lengthened far beyond the anther in the form of a plate, gland, feathery beard, &c. [170 169 n]; or it is split into two arms [169 b], or is articulated with the filament, across which it is placed, and on which it swings. In the latter case it either bears an anther-lobe on both arms [169 h], or only on one [l]; *Ex.* Salvia.

These are the most common deviations from the ordinary form of the connective: but there are many others; in fact the position of the anther-cells depends upon its form; if it is narrow, the lobes are parallel [169 c], but if it is triangular they become divergent [152 b]; if it is a mere point, the anther becomes versatile, *Ex.* Grasses; if it is enlarged, so as to extend beyond the lobes, then the anther is adnate; it is innate when the connective is firm enough to carry the anther-lobes stiffly on its parallel sides [169 c]. The connective is even globular in some of the Fringe Myrtles, and the anther is then analogous to such leaves as those of Sedum dasyphyllum.

441. The cavities of the anther containing pollen are the *cells,* and the place by which the pollen is emitted is the point or line of *dehiscence;* the membranous sides of the anther are named the *valves*.

442. Dehiscence usually takes place along a line which may be considered to indicate the margin of the lamina of the leaf out of which the anther is formed [169 e].

443. Sometimes a portion only of this line opens, and then the anther is said to dehisce by *pores* [172 c f t s].

444. If the line of dehiscence occupies both margins of the connective, and not the centre of the lobes, the anther opens by one valve instead of two, which is then hinged by its upper edge [172 d e].

445. If the line of dehiscence is next the centre of the flower, an anther is *introrse,* or *turned inwards;* if the line is next the circumference the anther is *extrorse,* or turned outwards.

446. The cells of the anther are usually two in number: sometimes they are four; *Ex.* Tetratheca: rarely one; *Ex.* Epacris: and still more rarely several; *Ex.* Viscum [172 b].

447. The number of cells appears to be determined by no certain rule.

448. Sometimes the cells are folded down upon themselves and become *sinuous* or *anfractuose* [172 g]; in other cases they are prolonged into bristles [f t], or tubes [c], or even into a spur; *Ex.* Melastomads [169 d].

449. Although in most cases the line of dehiscence is parallel with the anther-lobes, it is occasionally transverse [172 r]. In Laurus, the transverse and hinged (444) dehiscence being combined [172 e], the face of the anther breaks up into four hinged lobes.

450. It may be conjectured that the transverse dehiscence of an anther is analogous to the transverse articulation of petioles (261).

451. The anthers frequently grow together by their margin ; *Ex.* Composites. Such anthers are called *syngenesious.*

452. The *Pollen* is formed by a peculiar modification of the cellules of the parenchyma of the anther.

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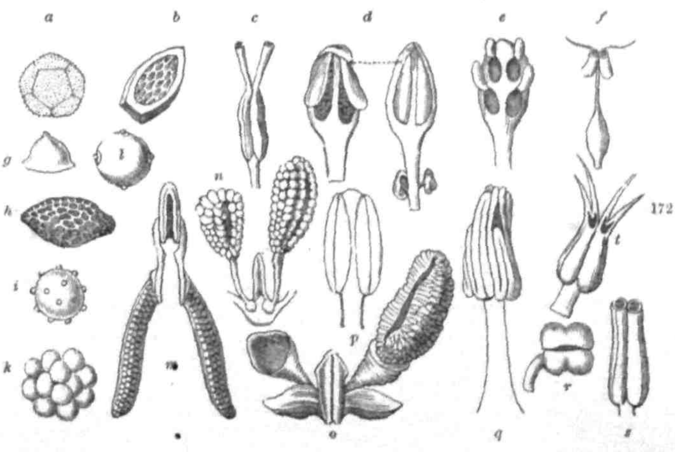
It is demonstrated that pollen is produced in the interior of the central cells of an anther by merismatic (59) increase. Each original cell is thus divided into two or three, or four other cells, which gradually change into pollen grains. During this process the original or mother cell is either absorbed, or remains in the form of a viscid or filamentary elastic matter, lying in the midst of the ripe pollen grains.

453. It consists of hollow cases, of extreme smallness, containing a fluid, or *fovilla,* in which float grains of starch and drops of oil.

454. Its shell is single, double, triple, or quadruple, and its sides are solid, pierced, or slit.

Its skins have received the following names :—
1. Extine, for the outermost.
2. Intextine, for that next the outermost.
3. Exintine, for that next the innermost.
4. Intine, for the innermost.

455. It is usually furnished with apertures [172 i 173], through which its lining is protruded in the form of a delicate tube, when the pollen comes in contact with the stigma.



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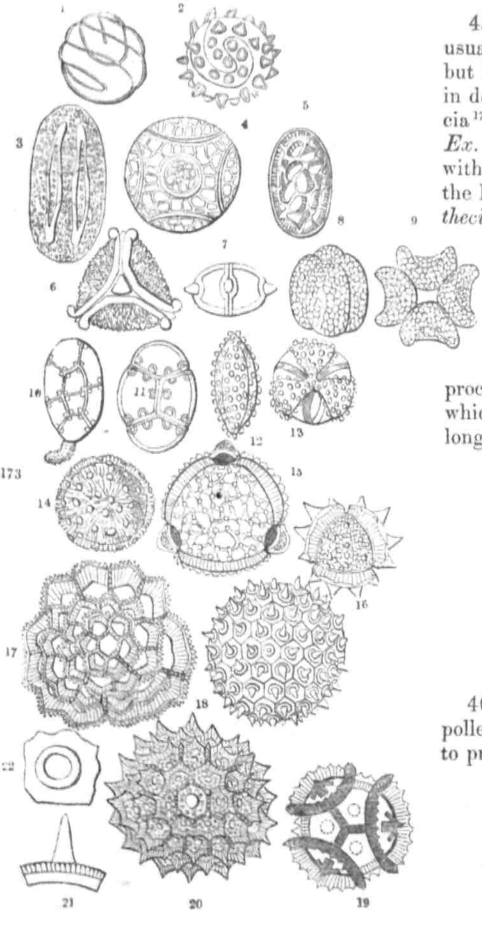
This protrusion may be imperfectly excited by placing pollen grains in weak sulphuric acid.

456. The shape of pollen grains is very variable ; the spherical [172 i], the triangular [g], the polygonal [a], the oblong [h], are common forms.

457. Its surface is smooth, or studded with points [172 i], or divided into facettes, or furnished with crested areolæ.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458. The pollen grains are usually distinct from each other, but in some cases they cohere in definite numbers ; *Ex.* Acacia [172 k] : or in irregular masses ; *Ex.* Orchids [n] : or are inclosed within a bag, which seems to be the lining of the anther (*Endothecium*); *Ex.* Asclepiads [m o].

459. In cases where the pollen grains cohere in masses, or are inclosed within bags, they are often connected with a cartilaginous or elastic process, called the *caudicle* [n], which adheres to a gland belonging to the stigma.

Although the caudicle is mentioned here, in consequence of its connection with the pollen, yet, like the gland, it is in reality a process of the stigma, as is proved by its development. It must not be confounded with the elastic matter which holds together the pollen grains (452).

460. The function of the pollen is to enable the ovules to produce an embryo.

Fig. 173.—Various forms of the Pollen, after Fritzsche : 1. Thunbergia alata, as seen when lying in oil ; 2. Thunb. fragrans ; 3. Passiflora lutea, in oil ; 4. Pass. incarnata ; 5. Pass. stipulata ; 6. Caryocar brasiliense, dry ; 7. Cuphea lanceolata, dry ; 8. Anona tripetala ; 9. Philydrum lanuginosum ; 10. A Pollen mass of Inga anomala, discharging a tube ; 11. Leschenaultia formosa, dry ; 12. Plumbago capensis, side view in oil ; 13. End view of the same, in water ; 14. Polemonium cœruleum ; 15. Geranium sylvaticum, acted on by iodine ; 16. Chrysanthemum carinatum, treated with concentrated sulphuric acid ; 17. Armeria vulgaris, ditto ; 18. Sida Abutilon, dry ; 19. Scolymus grandiflorus, treated with sulph. ac. fort. ; 20. Ipomœa purpurea, in oil ; 21. A section of the exine of Lavatera triloba, and one of its spines, treated with sulph. ac. fort. ; 22. A fragment of the exine of Nerium splendens, showing one of the openings in it.

XV.—OF THE DISK.

461. WHATEVER intervenes between the stamens and the pistil receives the general name of *disk*.

a

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462. It usually consists of an annular elevation, encompassing the base of the ovary, when it is sometimes called the *cup; Ex.* Pæony.

463. It also appears in the form of separate glands or tubercles at the base of an ovary [174 a], or of a waxy lining of the tube of the calyx ; *Ex.* Rose : or of tooth-like, hypogynous (428) processes ; *Ex.* Gesnera, Crucifers.

The disk must on no account be confounded with the *torus* or receptacle, which is a modification of the growing point (227).

464. It is certain that the disk is a non-development of an inner row or rows of stamens, as is proved by the Moutan Pæony.

465. The disk is one of the parts which Linnæan botanists call *nectary*, because it secretes honey.

466. It contains starch, or similar matter, convertible into sugar, and so applicable to the nutrition of the stamens or pistil.

The honey found in the flower is the surplus after these organs have been supplied. It is supposed to be formed in consequence of the accumulation of water near the flower, and the absorption of oxygen by it. The increase of temperature observed in flowers at the time when the honey is formed is referred to this or some other strong chemical action.

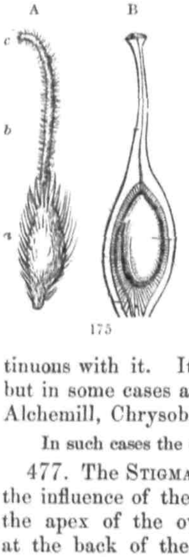
XVI.—OF THE PISTIL.

467. THE organ which occupies the centre of a flower, within the stamens and disk, if the latter be present, is called the *pistil* [175].

468. It is the female apparatus of flowering plants, or the *gynœceum*.

469. It consists of one or more *carpels*.

470. Each carpel is distinguishable into three parts; viz. the *ovary* [175 a], the *style* [b], and the *stigma* [c].



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471. If several carpels are united by their whole surface, as is often the case, then there are as many ovaries, styles, and stigmas, as there are carpels, whether they are distinguishable or not.

472. The OVARY is a hollow case, inclosing *ovules* [175 B]. It contains one or more cavities, called *cells*.

473. The STYLE is the part that connects the ovary and stigma.

474. It is frequently absent, and is no more essential to a pistil than a petiole to a leaf, or a filament to an anther.

475. It is commonly thread-shaped, or at least terete; but sometimes is thin, flat, and membranous, and assumes the form of a petal, as in Iris.

476. It is either articulated with the ovary, or continuous with it. It usually proceeds directly from the apex of the ovary; but in some cases arises from the side, or even the base of that organ; *Ex.* Alchemill, Chrysobalans.

In such cases the carpel is analogous to a hooded leaf.

477. The STIGMA is that part of the pistil which is adapted to receiving the influence of the pollen. It is generally at the end of the style or at the apex of the ovary, but not always; in Iris, it is placed in a cleft at the back of the style, and in Sarracenia [179], below the points of the convex style. It sometimes produces glandular or other processes, to which the pollen attaches itself in masses (459).

478. Nothing is, properly speaking, Stigma, except that part of the style just described. Nevertheless, the name is often inaccurately applied to mere divisions of the style, as in Labiates; or to the hairy surface of undivided styles, as in Lathyrus, or to the umbrella-shaped expansion of Sarracenia [176].

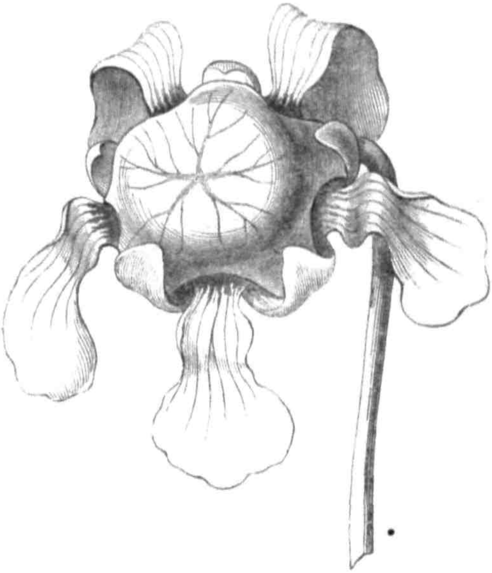
In the last case the true stigma is placed below the apex of the triangular segments of the umbrella-shaped style, and consists of a tuft of long free cells [179 a b].

479. Sometimes the stigmas grow to the face of the anthers, which form themselves into a solid mass; *Ex.* Asclepias. In this case the styles remain separate.

480. A CARPEL is formed by a folded leaf, the upper surface of which is turned inwards, the lower outwards; and within which are developed one or a greater number of *ovules* (526).

481. When the carpels are stalked, they are said to be seated upon a

thecaphore, or *gynophore* ; *Ex.* Cleome, Passiflora. Their stalk is analogous to the petiole of a leaf.



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482. When the carpels are all distinct, or are separable with facility, they are *apocarpous;* when they all grow into a solid body, which cannot be separated into its constituent parts, they are *syncarpous.*

483. The ovary is the lamina of the leaf.

484. The style is generally an extension of the midrib, but not always (485).

485. The stigma is the denuded, secreting, humid apex of the style.

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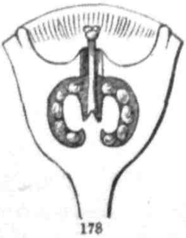

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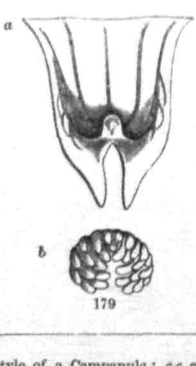

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Fig. 176.—The umbrella-shaped style and flower of Sarracenia.

Fig. 177.—Structure of the channel found in the centre of the style of a Campanula; *c c* cellular tissue forming the sides, traversed by brandles of spiral vessels, *v v*; *p p* are cells of another form, which line the sides, and, together with others of a long and filamentous character *f f*, obstruct the channel in part.

Fig. 178.—A section of the ovary, &c. of Babingtonia.

Fig. 179.—*a* The underside of the point of one of its lobes, with the back of the true stigma, which resembles a round tooth; *b* the stigma seen in front.

It is composed of a lax cellular tissue, well adapted for permitting any minute tubular bodies to pass down it [177], and is certainly, in many instances, derived from the placenta, which insinuates itself within the folds of the style, or even constitutes the style itself. This is placed beyond all doubt by Babingtonia [178], whose structure I explained in February 1842. In this plant the style is a direct extension of the placenta, and does not even touch the carpels, but is protruded through a hole in the vertex of the ovary. I also, in the beginning of 1840, showed that in the genus Impatiens, the style is made up of two parts, viz., an extension of the carpellary leaves, and a prolongation of the placenta, which forms the stigma and upper part of the style. The same is evidently the origin of the cupped stigma of Rhododendron, of the stigma of Cranesbills, and many other plants; but it can hardly be a universal rule, because in such plants as Armeria there seems no possible communication between the stigmatic canal and the placenta.

486. Where the margins of a folded leaf, out of which the carpel is formed, meet and unite, a development of cellular tissue sometimes takes place, forming what is called the *marginal placenta* [180].

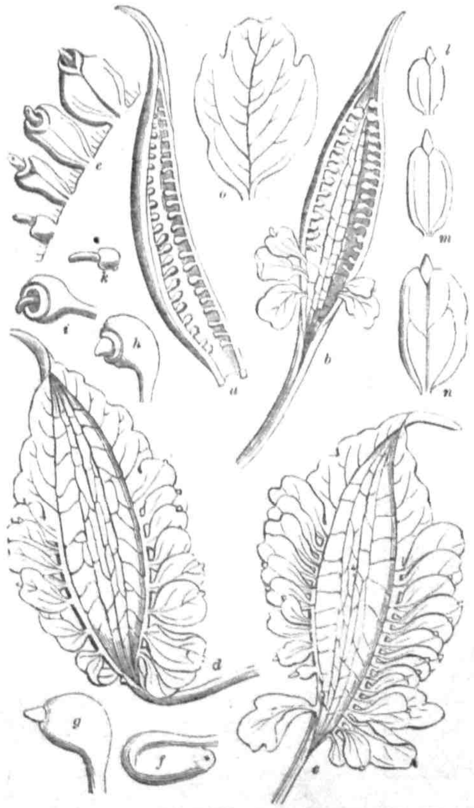

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Fig. 180.—*a* a Carpel of the common Columbine, Aquilegia vulgaris, opened to show the marginal station of the ovules; *b* the same a little altered in form, with its ovules in a state of change, and some of them in the condition of small leaves; *c d* further changes of the same kind; *e* to *o* ovules in various conditions, from the ordinary state to their absolute change into leaves. Drawn from specimens communicated by Mr. Marshall, of Ely.

487. Every such placenta is therefore composed of two parts, one of which belongs to one margin of the carpel, and one to the other.

The adjoining cut[180] offers conclusive proof as to this. It represents various states of the ovary of the common Columbine, with the ovules converted into leaves all along the margin of its follicles, and the latter at last converted into veiny leaves, of which the altered ovules seem but lateral lobes.

488 But although the placenta of many plants appears to derive its origin from the margin of the carpels, it is certain that in other instances the placenta is a development of the centre of the flower-bud, and in reality the end of the medullary system. Such a placenta is called *central.*

This is no doubt the structure in Mallowworts, Cranesbills, Tutsans, Cedrelads, and a host of others. Nor is there anything contrary to reason in the theory that two kinds of placentation exist in plants ; for buds, of which ovules are representatives, grow equally on the surface, edge, or axil of leaves. In the accompany-

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ing curious monster of the common Auricula[181], the true nature of the central placenta is demonstrated ; and it is further shown, that ovules, like buds, will appear from any and every part of the surface, for here they are starting up from the deformed petals and filaments, as well as from the placenta itself.

489. The central placenta being a state of the growing point, and the growing point having the power of branching, it is obvious that the central placenta may also branch, as it does in a great number of cases.

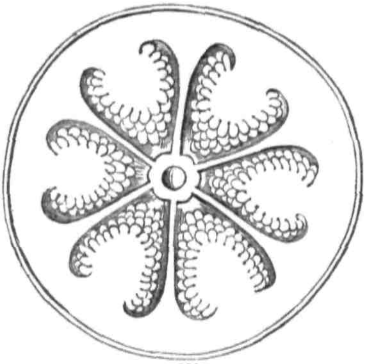
490. The *cords* or *funiculi,* on which ovules are sometimes fixed, may be regarded as one of the forms in which such branches exist.

491. But it is by no means necessary to assume that all placentæ are either marginal or central. On the contrary, as leaves can bear buds on any part of their surface, so may carpellary leaves bear ovules on any part of the surface.

492. Hence we have placentæ occupying the whole lining of an ovary, or, in other words, the whole surface of the carpellary leaf, as in Waterlilies and Butomads ; or intramarginal lines, as in Broomrapes ; or

the costal line, as in Orchids ; or a part of it, as in Punica [182], Fig Marigolds, &c.

This is contrary to the theory expressed by Dr. Robert Brown, (See *Ann. Nat. Hist.* xi. 35); but notwithstanding so high an authority, I must confess that each succeeding inquiry renders the views of that great botanist more and more untenable, even if Schleiden's arguments and Mr. Babington's curious monster of Cerastium (see *Vegetable Kingdom*, p. 497) did not alone demonstrate the very partial applicability of the old marginal theory.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493. Since the carpels are modified leaves, they necessarily obey the laws of arrangement of leaves, as they develope round a common axis.

494. And as they are leaves folded inwards, their margins are necessarily turned towards the axis. A placenta, therefore, formed by the union of those margins, will be invariably next the axis.

495. So that if a whorl of several carpels with a marginal placentation unite and constitute a pistil, the placentæ of that pistil will be all in the axis.

496. The normal position of the carpels is alternate with the innermost row of stamens, to which they are also equal in number ; but this symmetry of arrangement is constantly destroyed by the abortion or non-development of part of the carpels.

497. The carpels often occupy several whorls, in which case they are usually distinct from each other ; *Ex.* Ranunculus, Fragraria, Rubus.

498. Sometimes, notwithstanding their occupying more than one whorl, they all unite into a single ovary ; *Ex.* Nicotiana multivalvis, Monstrous Citrons. In these cases the placentæ of the innermost whorl of carpels occupy the axis, while those of the exterior carpels are united with the backs of the inner ones, as must necessarily happen in consequence of the invariable direction of the placentæ towards the axis.

499. When the carpels are arranged round a convex receptacle (523), the exterior ones will be lowest ; *Ex.* Rubus.

500. But if they occupy the surface of a tube, or are placed upon a concave receptacle, the exterior ones will be uppermost ; *Ex.* Rosa.

501. Whenever two carpels are developed, they are invariably opposite each other, and never side by side. This happens in consequence of the law of alternate opposition of leaves (250).

502. When carpels unite, those parts of their sides which are contiguous grow together, and form partitions between the cavities of the carpel.

503. These partitions are called *dissepiments*.

504. Each dissepiment is therefore formed of two layers. But these often grow together so intimately as to form but one layer.

505. Such being the origin of the dissepiments, it follows that,

506. All dissepiments are vertical, and never horizontal ;

507. They are uniformly equal in number to the carpels out of which the pistil is formed ;

508. A single carpel can have no dissepiment.

509. It will also be apparent, that as the stigma must bear the same relation to the dissepiments as the point of the leaf to the sides of the lamina, the stigma will always be alternate with (between) the dissepiments.

It is supposed that the exceptions to this rule are only apparent, and arise from deeply 2-lobed stigmas becoming united by their contiguous arms.

510. When the dissepiments of a many-celled pistil are so short as not to separate the cavity into a number of distinct cells, but merely project into it, the placentæ, which occupy the edges of these dissepiments, become what is called *parietal* [183 184 r]; *Ex.* Poppy. Occasionally the placentæ are diffused over the whole face of the dissepiments, as in Butomus. In other instances, they occupy lines along the inside wall of the carpels, as in Broomrapes, and then bear no relation to the stigmas.

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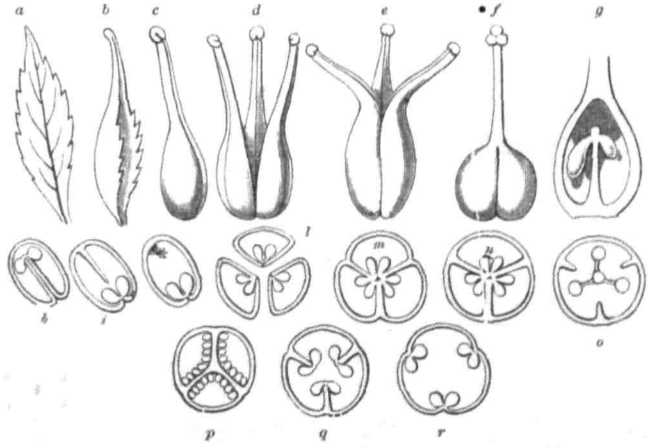
511. A one-celled ovary may also be formed out of several carpels, in consequence of the obliteration of dissepiments; or because the carpellary leaves are not turned in far enough to reach the centre [184 o], or because they do not turn inwards at all [184 r].



Some of the foregoing diagrams explain these laws: [a] is a leaf; [b], a leaf rolled up preparatory to its conversion into a carpel; [c] and [k], a carpel; [d] and [l], three carpels approximated, but not united; [e] and [m], the same united at the ovaries, but disunited at the styles; [f] and [n], these completely united into one ovary, one style, and one stigma.

512. Moreover, their true nature is often masked by adhesions, &c., as in Cucurbits.

See the explanation of this very curious fact in the *Vegetable Kingdom*, p. 313.

513. All dissepiments whose position is at variance with the foregoing laws are spurious.

514. *Spurious dissepiments* derive their origin from various causes, and may have either a vertical or horizontal position.

515. When they are horizontal they are called *phragmata*, and are formed by the distension of the lining of the ovary; *Ex.* Cathartocarpus Fistula.

516. If vertical, they either are projections from the back of the carpel, as in Amelanchier and Thespesia [184 i]; or they are caused by modifications of the placentæ [199], as in Martynia, Didymocarpus, and Crucifers; or they are produced by the turning inwards of the margins of the carpels [184 h].

The singular fruit of Diplophractum [187], consisting of five cavities in the axis, surrounded by five two-celled cavities at the circumference, must be composed of carpels constructed as just described, and arranged in several series (497). This is explained by the following cut, where [187] is a section of the fruit of Diplophractum; [186] shows an ideal arrangement of fifteen carpels in three rows, five being

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external and perfect, with the margins of the carpels turned inwards (480); five being altogether imperfect, and the five in the centre being less imperfect, [185] shows the transverse section of this ideal figure. In the ripe fruit we must suppose the intermediate carpels to be obliterated, and the spurious dissepiments of the external carpels to be pressed up against their back, so as to bisect the cavity of each carpel.

517. The styles of different carpels frequently grow together into a solid cylinder [184 f]; *Ex.* Lilium. There are various degrees of union between the styles.

518. The style is incorrectly said to be divided in different ways, in consequence of this adhesion.

519. If the *ovary* adheres to the sides of the calyx it is called *inferior*, and the *calyx* is said to be *superior; Ex.* Apple.

520. If it contracts no adhesion with the sides of the calyx it is called *superior*, and the *calyx inferior*.

XVII.—OF THE RECEPTACLE, OR TORUS.

521. The growing point usually extends not merely into the cavity of the carpels, forming a placenta, but rises up between them, constituting the *receptacle*, *torus*, or *gynobase*.

522. It is usually a mere thread or point in syncarpous ovaries, but it occasionally forms a very conspicuous organ.

523. It is the fleshy receptacle of a Strawberry, the core of a Raspberry, the beak of a Cranesbill, the truncated alveolate table of Nelumbium.

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524. It will occasionally lose its torpid character, and grow into a branch [188]; or it will divide into arms, without forming leaves [189].

525. The cellular club-shaped naked spadix (374) of Arum and its allies is another condition of this same organ.

Fig. 188.—A Rose with the receptacle, or growing point, extending into a branch, with leaves.
Fig. 189.—A Strawberry with the receptacle, or growing point, extended into short branches, without leaves.

XVIII.—OF THE OVULE.

526. THE OVULE [190] is a body borne by the placenta (486), and destined to become a seed.

527. It is to the carpel (480) what marginal buds are to leaves (293), and to the central placenta what buds are to branches.

528. It may be regarded as a bud with a retrograde development.

529. The ovule is usually inclosed within an ovary (472); but in Conifers and Cycads it is destitute of any covering, and is exposed, naked, to the influence of the pollen.

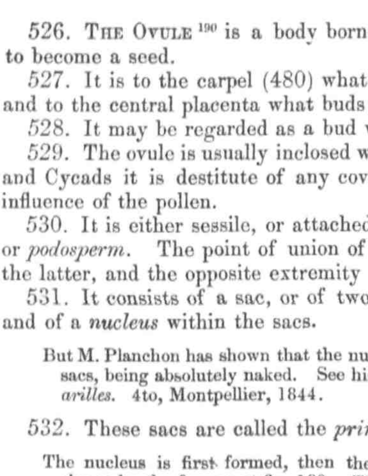
530. It is either sessile, or attached by a little stalk called the *funiculus*, or *podosperm*. The point of union of the funiculus and ovule is the *base* of the latter, and the opposite extremity is its *apex*.

531. It consists of a sac, or of two sacs, one inclosed within the other, and of a *nucleus* within the sacs.

But M. Planchon has shown that the nucleus of Veronica hederæfolia is destitute of sacs, being absolutely naked. See his excellent *Mémoire sur les vrais et les faux arilles.* 4to, Montpellier, 1844.

532. These sacs are called the *primine* and *secundine*.

The nucleus is first formed, then the secundine, and then the primine, as is shown by the figures at fig. 180. The nucleus would seem to be itself a growing point, and the sacs to be scales formed round it analogous to the scales of a leaf-bud. In the bud itself the growing point comes first, necessarily; then succeed the scales.



533. The primine, secundine, and nucleus, are all connected with each other by a perfect continuity of tissue, at some point of their surface.

534. When the parts of the ovule undergo no alteration of position during their growth, the two sacs and the nucleus are all connected at the base (530) of the ovule, which is *orthotropal* or *atropal* [190 a 191 a].

535. And then the base of the nucleus and that of the ovule are in immediate connection with each other [177 a].

536. But the relative position of the sacs and the base of the ovule are often entirely altered during the growth of the latter, so that it frequently happens that the point of union of the sacs and the nucleus is at the apex (530) of the ovule [190 c].

537. And then the base of the nucleus is at the apex of the ovule.

538. In such cases, a vascular connection is maintained between the base

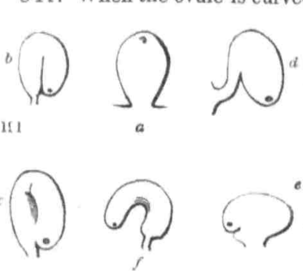
Fig. 190.—A An orthotropal ovule, highly magnified, showing the foramen; B a section of it; C a section of an anatropal ovule; * the foramen; *f* the chalaza; *e* the raphe; *d* the sac of the amnios.

of the ovule and the base of the nucleus, by means of a bundle of vessels called a *raphe* [190 e].

539. The normal position of this raphe is on the side of the ovule, next the placenta.

540. The expansion of the raphe, where it communicates with the base of the nucleus, gives rise to the part of the seed called the *chalaza* (642) [190 f].

541. When the ovule is curved downwards so as to approach the placenta, it is *camptotropal* [191 b]; when curved downwards and grown to the lower half, *anatropal* [190 e 191 c]; when attached by its middle so that the foramen is at one end and the base at the other, it is *campylotropal* or *amphitropal* [191 e]; when horse-shoe shaped it is *lycotropal* [191 f]; when anatropal with the raphe half loose, it is *semianatropal* [191 d].



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542. The mouths of the primine and secundine usually contract into a small aperture called the *foramen* of the ovule, or the *exostome* [190 *].

543. The apex of the nucleus is always applied to this foramen.

544. In consequence of the relation the base of the nucleus bears to the base of the ovule, the foramen will be at the apex of the ovule when the two bases correspond, and at the base of the ovule when the two bases are diametrically opposite.

545. The foramen indicates the future position of the radicle of the embryo; the radicle being usually next the foramen. This is a fact of great importance in practical Botany.

Gasparrini, however, asserts that, in the China orange, this is sometimes reversed: the radicle being turned to the chalaza.

546. Within the nucleus is a cavity or bag, called the *sac of the amnios* [190 dd], containing a fluid, in which the embryo is developed.

The nucleus of some plants is pierced by the amniotic sac, which projects beyond the foramen as a tube, as in Santalum, Narthecium (557), &c. M. Planchon also found that in Veronica hederæfolia (531) the side of the naked nucleus is ruptured lengthwise by the amniotic sac, so as to become naked also. Something quite analogous occurs in Avicennia.

XIX.—OF FERTILISATION.

547. The fertilisation of a flower appears to be accomplished by the action of pollen (452) upon the stigma (477).

The proofs of this are so many and so seemingly conclusive, that it is usual to regard the proposition as unassailable. But it is necessary to add that some facts are apparently irreconcilable with it. The chief of these is the case of a diœcious Spurgewort, allied to Sapium, and called Cœlebogyne, of which the female only is known. This plant produces ripe and *perfect* seeds in the Botanic Garden, Kew; and yet the most diligent search has failed to discover any polliniferous flowers. Is it fertilised by the pollen of some other plant? This seems improbable, because the seedlings are exactly like their mother, which is not the case with vegetable hybrids (551). Certain experiments instituted by M Girou de Buzareingues have led him to the conclusion, that in Hemp, the Lychnis dioica, and other diœcious plants, the presence of pollen is not necessary to fertilise the ovule (*Ann. Sc.*, 1st ser., xxx 406). And it appears certain that in some instances Cucumbers have swelled fruit, and ripened seeds, in the absence of pollen. Finally, we have the assurance of Decaisne that in Viscum the ovule is not formed till six weeks or two months after the pollen has acted on the stigma; and Professor Gasparrini maintains that in the Fig-tree the embryo is formed without any fertilisation whatever; for the summer crop of this fruit is obtained from female flowers, which can by no possibility communicate with stamens, the male flowers not being formed at that time, and nevertheless *it abounds in seeds containing the embryo*; while, on the other hand, the spring figs, *in which male flowers do occur, never have any embryo in their seeds!* (*See Ann. Sc.*, 3rd ser., v. 306).

548. The result of that action seems to be the formation of an embryo (650) within the nucleus of the ovule.

549. When the pollen and stigma each belong to the same species, then that species is propagated without material alteration.

550. But if they belong to different species, then their mutual action results in the production of *hybrids*, or vegetable mules.

This is not an artificial process, but happens frequently in wild nature, and is yearly giving rise to the false species of botanists.

551. A hybrid is not necessarily sterile, but is often capable of propagating its race.

552. The hybrid resembles the male parent most in foliage, and the female in flower.

This has been proved to be the general rule by the numerous experiments of the Dean of Manchester. See Dr. Herbert's papers in the second volume of the *Journal of the Horticultural Society*.

553. The expulsion of pollen from the anther is due to the contraction of its valves. It is naturally effected in dry, warm weather; and cannot take place in the presence of wet, except in species whose fertilisation is effected under water.

It is not improbable that, as De Buzareingues has suggested, the noxious effect of wet upon fertilisation may consist partly in preventing the anther-cells from opening, and partly in the activity which it gives to the vegetation of the stem.

554. The pollen is enabled to act upon the ovule by means of an extension of its inner lining, if it has more than one coat (454), in the form of a tube or tubes.

555. The *pollen-tube* insinuates itself between the cells of the stigma [192], and passes down its conducting tissue till it reaches the interior of the ovary.

556. Having reached the interior, a similar tube appears, and connects the apex of the nucleus of the ovule, through the foramen, with the conducting tissue of the style [193 194].

557. The result of this action is the formation of a living point which eventually becomes the embryo.

In the present state of knowledge as to this point, the above seems to be the safest way of stating facts. The common opinion among botanists is, that the pollen-tubes pass directly to the nucleus, through the foramen. There is no question that pollen-tubes of great length grow out of the pollen-grains, and plunge into the stigma. The curious phenomena connected with Asclepiads, and more especially with Morrenia, in which great mechanical difficulties are overcome by the pollen-tubes before they can reach the stigma, prove that this phenomenon is connected with vitality of a very high order. Neither is there room for doubting whether *similar* tubes appear in the cavity of the ovary, connecting the conducting tissue of the style with the apertures of the ovules (see figs. [193] and [194]).

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But it may be reasonably questioned whether the tubes are the same in both cases. Not that there is any difficulty in understanding how so great and rapid a growth on the part of the pollen-tubes as is assumed should take place; for the starch of the fovilla (453) may be regarded as a store of organizable matter provided for this express purpose, as Brown suggested. The doubt arises from the impossibility in many cases of so tracing the small delicate transparent threads as to be certain that they do not become blended with long cells having a different origin, and that it is not the latter which are seen in the cavity of the ovary. It is asserted, indeed, that these tubes have been distinctly traced *ab origine*; and no doubt can be entertained that observers have thought so. The question is, may they not have been deceived? Dr. Dickie positively asserts that in Narthecium the so-called pollen-tubes in the interior of the ovary are really ovule-tubes, or delicate filaments, rising from the apex of the nucleus, and ad-

Fig. 192.—A grain of pollen sending its pollen-tube down among the stigmatic cells of Papaver.—*Mohl.*

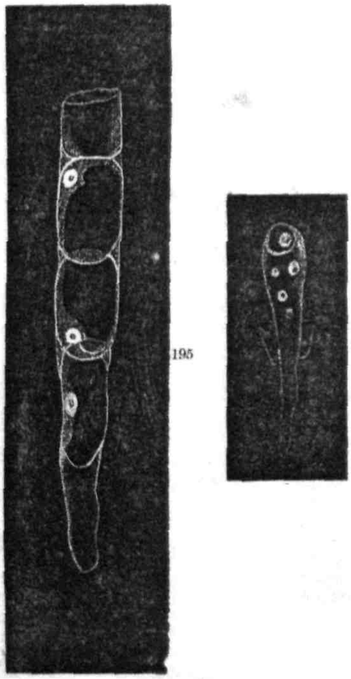
Fig. 193.—A longitudinal section of the carpel of Euphorbia pallida at the time when the pollen-tube *p* has reached the apex of the nucleus *n n*. It appears as a dark streak passing through the filamentary conducting tissue of the style; *a* is the sac of the amnios, and *c* the chalaza.—*Schleiden.*

Fig. 194.—A longitudinal section of the interior of the ovary of a Helianthemum, with the pollen-tubes descending from *a*, and reaching the foramina of the ovules which are forcibly detached from their placenta.—*Schleiden.*

vancing upwards into the cavity; and he speaks of the same structure occurring in Bartsia, &c. This is quite conformable to the observations of Griffith upon the ovule of Santalum, in which he found the amniotic sac much extended beyond the foramen. The most startling announcement lately made as to this point is from Prof. Gasparrini, who, in the place above quoted, asserts that in the Orange-tree the pollen *does not emit tubes at all*. He admits, however, that the introduction of a tubular filament into the foramen is necessary to fertilisation, whatever be the source from which it is derived. He further concludes, that in Cytinus Hypocistis these filaments do not come from the pollen grains, but from the conducting tissue of the style. This gentleman, the discoverer of cistomes (107), is too good an observer to be disregarded.

558. Immediately after the aforesaid action of the pollen-tubes, a new centre of vitality manifests itself in the sac of the amnios next the apex of the nucleus, and gradually grows into an embryo.

The whole of the facts belonging to this phenomenon will perhaps never be ascer-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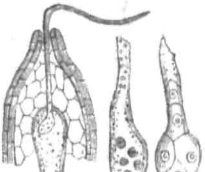

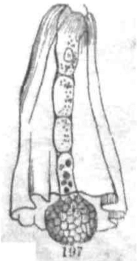
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tained. Nor is it possible in such delicate and difficult observations to determine

Fig. 195.—*a* a portion of the embryo and of the pollen-tube of Orchis morio, in the upper part of which cells have formed; the embryo end has as yet no cellularity; *b* the embryo end of the pollen-tube of Linum pallescens, inserted between the lips of the sac of the amnios. The cell formation is commencing. —*Schleiden*.

Fig. 196.—*a* Longitudinal section of the mouth of the ovule, into whose nucleus a pollen-tube has penetrated, and reached the sac of the amnios. The tube contains starch about to change into gum. *b* The extremity of this pollen-tube much more magnified, and containing Cytoblasts; *c* the same, a few days older, cells having distinctly formed and commenced the embryo.—*Schleiden*.

Fig. 197.—The end of the pollen-tube of Limnanthes some time after its entry into the sac, which is cut away to show it. Its lower extremity is already organised as a rudimentary embryo, consisting of round greenish cells; in the upper part are chlorophyll grains—*Schleiden*.

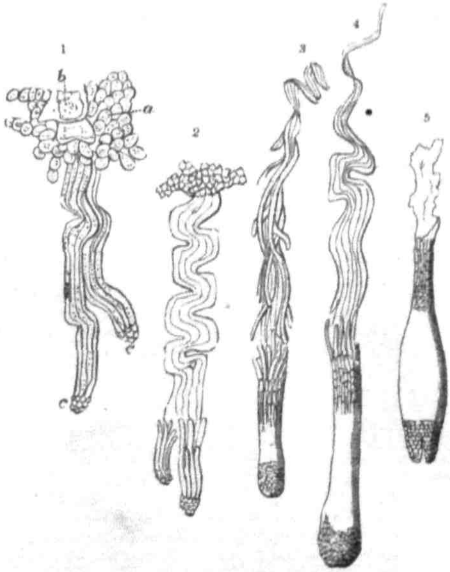
exactly what course Nature follows. According to Schleiden, the point of the pollen-tube enters the nucleus, and itself becomes the embryo. Others say that the amniotic sac is indented, and the fold becomes the embryo. Others hold that the appearance of the embryo is the result of mere contact between the pollen-tube and the apex of the nucleus. Brown's observations upon the formation of the embryo in Conifers favour the supposition that the amniotic sac is pierced; for he finds the embryo in such plants developed below brown conical or calyptrate membranes, whose base seems to pass gradually into the light pulpy substance of which the amnios consists. Such membranes may be regarded as the sacs themselves of amnios.

559. More than one embryo may be developed in the same ovule.

This is very common in the Onion and the Miseltoe, and appears to be the rule in Conifers and Cycads, where Brown first remarked that the embryos have a constant and regular arrangement. It has been conjectured that a plurality of embryos is caused by the action of a plurality of pollen-tubes; but observations are wanted to confirm this opinion.

560. In some plants the nascent embryo is suspended by cords, which hang down from the apex of the amniotic sac, and are called *suspensors* [198].

These are often abortive, the embryotic point originally formed at their extremity disappearing, when a shrivelled cord alone remains. In some cases the suspensor is enormously long. (See *Vegetable Kingdom*, p. 233).



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561. In its gradual development the embryo usually directs its radicle (656) to the foramen (see 545). This arises from the being the part first formed. The Cotyledons are an after-growth.

Fig. 198.—Progressive development of the embryo of the Yew, according to *Mirbel* and *Spach*. 1, a pair of young suspendors hanging from the vesicle *b*, lodged in young albumen *a*, and bearing the beginning of an embryo at *c*. 2, Another pair of suspensors, a little older, and adhering to each other for the greater part of their length; 3, 4, 5, further advances in growth of the embryo, and breaking up or absorption of the conductors.

562. The embryo is fed, during its growth, by the matter contained in the nucleus and its envelopes.

563. The temperature of a flower is augmented during the progress of fertilisation, owing to the chemical changes going on in the contents of the cells surrounding the sexual organs (466).

At this time oxygen disappears, and in Arads, whose structure allows the heated air to be retained, the temperature has been found to equal 11 centigrade degrees above the surrounding air.

XX.—OF THE FRUIT.

564. THE FRUIT, in the strictest sense of the word, is the pistil (467) arrived at maturity. But the term is also applied to the pistil and floral envelopes (392) taken together, whenever they are all united in one uniform mass.

565. Hence, whatever is the structure of the pistil, the same should be the structure of the fruit.

566. But in the course of the advance of the pistil towards maturity, many alterations take place, in consequence of abortion, non-development, obliteration, and union of parts.

567. Whenever the fruit contains anything at variance with the laws that govern the structure of the pistil, the latter should be examined for the purpose of elucidation.

568. Sometimes a pistil with several cells produces a fruit with but one; *Ex.* the Hazel-nut and Cocoa-nut. This arises from the obliteration of part of the cells.

569. Or a pistil, consisting of one or two cells, changes to a fruit having several: the cause of this is a division and doubling of the placentary plates; *Ex.* Pretrea [199]: or the expansion inwards of portions of the endocarp (573), [200 201].

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This is a very common occurrence, and usually has the effect of cutting off a cavity, originally simple, into many cells, separated by horizontal divisions. Of this kind of structure Cneorum [201] and Tribulus [200] are striking examples.

570. As the fruit is the maturation of the pistil, it ought to indicate upon its surface some traces of a style; and this is true in all cases, except Cycads and Conifers, which have no ovary.

571. Hence the grains of corn, and many other bodies that resemble seeds, having traces of the remains of a style, cannot be seeds, but are minute fruits.

572. That part which was the shell of the ovary in the pistil, becomes the pericarp in the fruit.

Fig. 199.—Cross section of fruit of Pretrea zanguebarica.
Fig. 200.—Perpendicular section of the fruit of Tribulus.
Fig. 201.—Perpendicular section of the fruit of Cneorum.

573. The PERICARP consists of three parts ; the outer coating called the *epicarp*, the inner lining called the *endocarp*, or *putamen*, and the intermediate substance named the *sarcocarp*.

574. Sometimes these three parts are all readily distinguished ; *Ex.* the Peach : frequently they form one uniform substance ; *Ex.* a Nut.

575. The *base* of the fruit is the part where it is joined to the peduncle. The *apex* is where the remains of the style are found.

576. The axis of the fruit is often called the *columella;* the space where two carpels unite is named the *commissure*.

577. All fruits which are mere modifications of a single carpellary leaf (480) have always a suture corresponding with the junction of the margins, or with the placentæ, and often another corresponding with the midrib of the carpellary leaf : the former is called the *ventral*, the latter the *dorsal suture*.

578. If the pericarp neither splits nor opens when ripe, it is said to be *indehiscent ;* if it does split or open, it is said to *dehisce*, or to be *dehiscent ;* and the pieces into which it splits are called the *valves* [202].

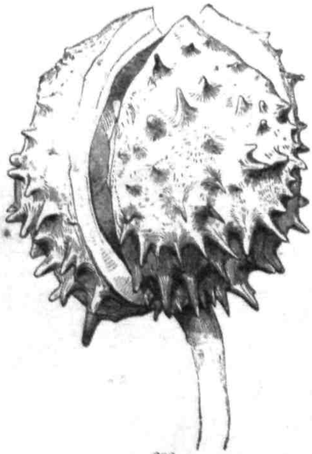
579. The dehiscence of the pericarp takes place in different ways.

580. If it takes place longitudinally, or vertically, so that the line of dehiscence corresponds with the junction of the carpels, the dissepiments are divided, the cells remain closed at the back, and the *dehiscence* is called *septicidal*.

In this case the carpellary leaves merely separate from each other.

581. Formerly, botanists said that in this kind of dehiscence the *valves were alternate with the dissepiment ;* or, that the *valves had their margins turned inwards*.

582. If it takes place vertically, so that the line of dehiscence corresponds with the dorsal suture, the dissepiments remain united, the cells are opened at their back, and the dehiscence is called *loculicidal* [203].



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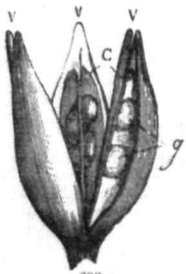

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583. Formerly, it was said that in this kind of dehiscence *the dissepiments were opposite the valves.*

584. When a separation in the pericarp takes place across the cells horizontally, the dehiscence is *transverse* ; *Ex.* Anagallis.

585. If the dehiscence is effected by partial openings of the pericarp it is said to take place by pores ; *Ex.* Poppy.

586. Sometimes the cells remain closed, separating from the axis formed by the extension of the growing point (230) ; *Ex.* Umbellifers, Euphorbia

587. Or the cells open and separate from the axis, which is formed by a cohesion of the placentæ which separate from the dissepiments.

All these are cases of central placentation, and are much more common than is supposed.

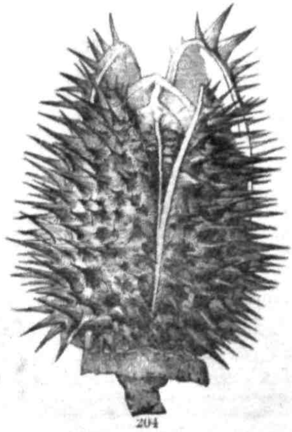
588. Sometimes the dissepiments cohere at the axis, and separate from the valves (578) or back of the carpels, when the dehiscence becomes *septifragal* [204].

In such cases the dissepiments are either composed of mere placentary plates, or of the sides of carpellary leaves.

589. The dissepiments of a fruit are usually formed by the confluent sides of carpellary leaves (480), and are placed at right angles to the axis.

590. But peculiarities of structure interfere with this rule, and give rise to spurious dissepiments having a different position.

Thus in Stramonium [204] one dissepiment [205] *a a* is produced by the sides of carpellary leaves, and another *b b* by the confluence of the placentæ and a projection of the dorsal suture. In Nigella [206], on the other hand, where 10 cells occur in a fruit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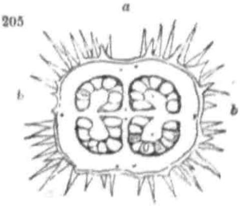

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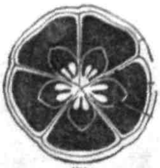
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derived from 5 one-celled follicles (596), the 5 additional cells are spurious, and caused by the separation of the endocarp from the mesocarp ; in this instance the anomalous dissepiments are formed by the endocarp, and the spurious cells are mere *lacunæ*, or air cavities.

591. All fruits are either *simple* or *multiple*.

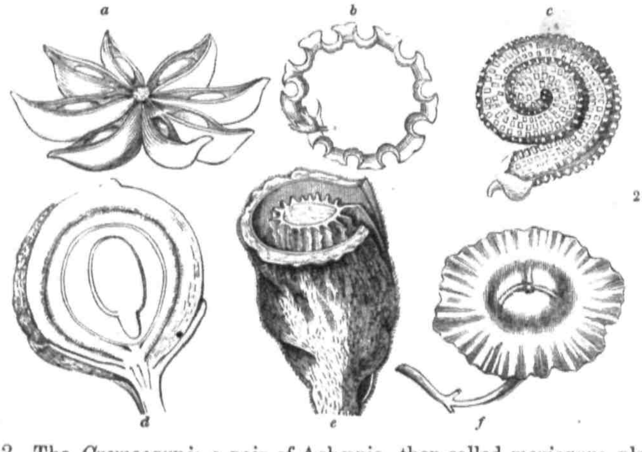
592. Simple fruits proceed from a single flower ; *Ex.* Pæony, Apple, Nut, Strawberry.

593. Multiple fruits are formed out of several flowers ; *Ex.* Fir, Pine-apple, Fig. They are masses of inflorescence in a state of adhesion, and are called *anthocarpous*.

610. When the siliqua is very short, or broader than it is long, it is called a *Silicula*.

611. The *Nut* or *Gland* is a dry, bony, indehiscent, one-celled fruit, proceeding from a pistil of two or more cells, and inclosed in an involucre called a *Cupule* ; *Ex.* the Hazel, Acorn. It is a sort of compound achænium.

In some Palms, *Ex.* Sagus, it is covered by lozenge-shaped spaces resembling scales turned downwards [212 d], the origin of which is unknown. It is often bordered by expansions or wings which surround it longitudinally, as in the Elm [207 e] ; or transversely, as in Paliurus [210 f] ; or proceed from the apex or back only, as in Sycamore [207 i], in which case it receives the name of *Samara*.



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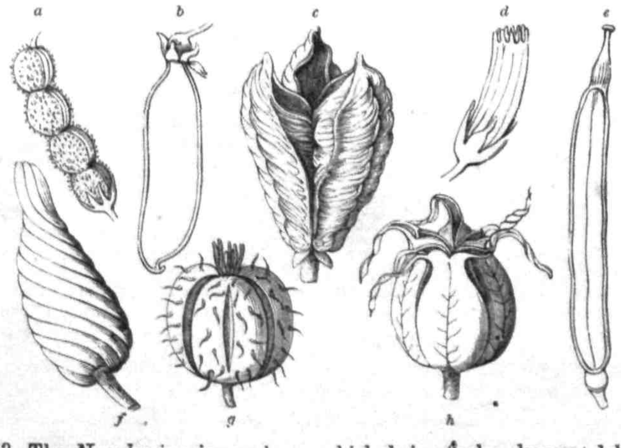
612. The *Cremocarp* is a pair of Achænia, then called *mericarps*, placed face to face, and separating from a central axis ; *Ex.* Umbellifers [207 l]. Their planes of union constitute the *commissure*.



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613. The *Nuculanium* is a pericarp, which, being fleshy, does not dehisce ; *Ex.* Grape, Arbutus [212 a].

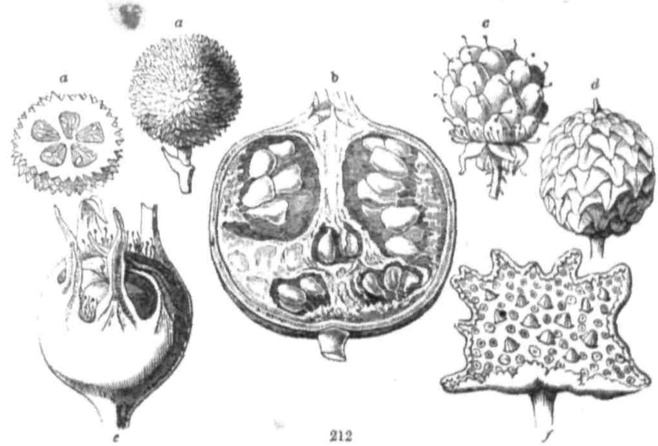
614. The *Pyxis* is a capsule whose dehiscence takes place transversely [207 k]; *Ex.* Hyoscyamus, Anagallis.

615. The *Etærio* is a collection of distinct, indehiscent carpels, fleshy or dry, within a calyx; *Ex.* Rubus [212 c].

616. The *Berry* is a succulent fruit, the seeds of which lose their adhesion when ripe, and lie loose in pulp; *Ex.* a Gooseberry.

617. The *Orange* is a berry having a pericarp separable into an epicarp, an endocarp, and a sarcocarp, and the cells filled with pulpy bags, which are cellular extensions of the sides of the cavity.

618. The *Pome* is a union of two or more inferior carpels, the pericarp being fleshy, and formed of the floral envelope and ovary firmly united [212 e].



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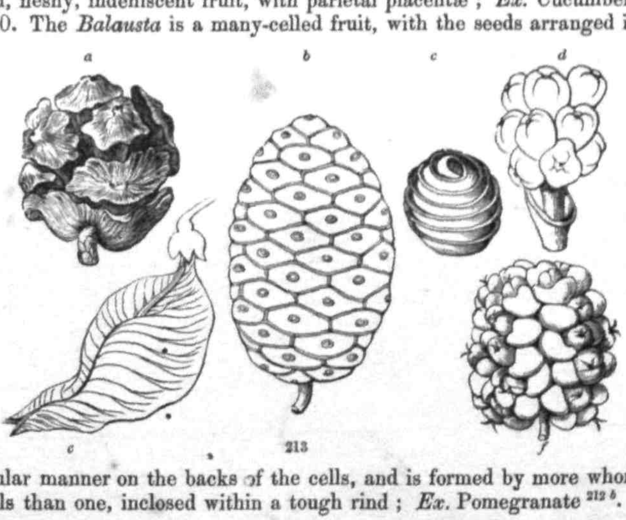
619. The *Pepo* is composed of about three carpels, forming a three-celled, fleshy, indehiscent fruit, with parietal placentæ; *Ex.* Cucumber.

620. The *Balausta* is a many-celled fruit, with the seeds arranged in an



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irregular manner on the backs of the cells, and is formed by more whorls of carpels than one, inclosed within a tough rind; *Ex.* Pomegranate [212 b].

621. The most remarkable modifications of multiple or anthocarpous fruits are, the Cone (622), Pine-apple (623), and Fig (624).

622. The *Cone*[213 a b] is an indurated amentum (371); *Ex.* Pinus. When it is much reduced in size, and its scales firmly cohere, it is called a *Galbulus*; *Ex.* Juniperus.

623. The *Pine-apple* is a spike of inferior flowers, which all grow together into a fleshy mass.

624. The *Fig* is the fleshy, hollow, dilated apex of a peduncle, within which a number of flowers are arranged, each of which contains an achænium; *Ex.* Ficus, Dorstenia[212 f].

Of the terms above explained only a few are in common use, and it seems to be found by systematic botanists more convenient to describe a given fruit by exact words than to use any particular term. The names most employed are the Achænium, Nut, Caryopsis, Drupe, Capsule, Siliqua, Legume, and Cone.

XXI.—OF THE SEED.

625. THE SEED is the ovule (526) arrived at maturity.

626. It consists of integuments (634) and embryo (650); and is the result of the fertilising process.

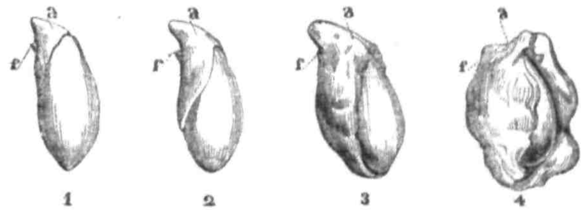
627. In general seeds are, like ovules, inclosed within a covering arising from a carpellary leaf (480); but all Gymnosperms are an exception to this. Moreover, some ovules rupture the ovary soon after they begin to advance towards the state of seed, and thus become naked seeds; *Ex.* Leontice. Others are imperfectly protected by the ovary, the carpels not being perfectly closed up; *Ex.* Reseda.

628. The seed proceeds from the placenta (486), to which it is attached by the *funiculus* [215 g], which is sometimes very long, but is more frequently not distinguishable from the placenta.

629. Sometimes the funiculus, or the placenta, or the edge of the foramen, expands about the seed into a fleshy body; *Ex.* the *Mace* of a Nutmeg, Euonymus, &c. This expansion is named *aril* [214 215 a b c].

630. It is never developed until after the vivification of the ovule, and must not be confounded with tumours or dilatations of the integument of the seed.

M. Planchon has pointed out the existence of two distinct kinds of aril. In the one, which he regards as the true aril, the expansion proceeds from the funiculus, and covers over the foramen; in the other, which he calls an *arillode* [214], it pro-



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ceeds from the lips of the foramen itself, which is therefore external, and never closed up. A true aril occurs in Passiflora, Tetracera, &c.; that of Euonymus is an arillode, as is probably the Mace of Nutmeg according to M. Planchon.

631. Sometimes there are tumours of the testa near the hilum, or at the opposite end; such are called *Strophiolæ* or *Carunculæ* [215 f].

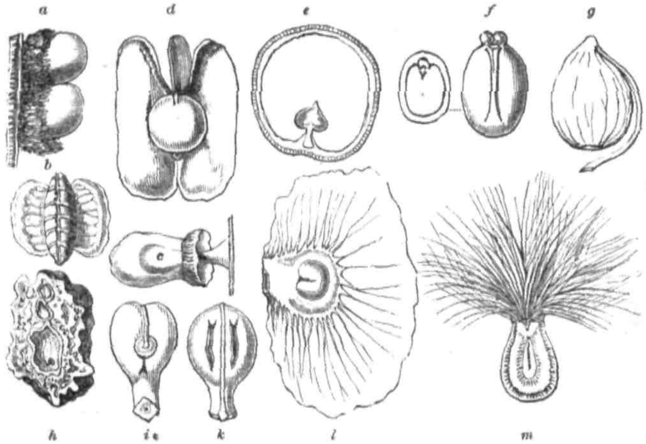
632. The precise nature of these is unknown; sometimes they are dilatations of the chalaza; *Ex.* Crocus: or they are caused by a fungous state of the lips of the foramen; *Ex.* Ricinus: or they arise from the raphe, &c.

633. The scar, which indicates the union of the seed with the placenta, is called the *hilum or umbilicus* [215 i].

Fig. 214.—Progressive formation of the arillode of Euonymus; *a* the arillode; *f* the funiculus, which attaches this seed to the placenta; 1 is the youngest; 4 the oldest.

634. The integuments are called collectively *testa*, and consist of membranes resulting from the sacs of the ovule (526).

635. Sometimes the testa is covered by hair-like expansions of its whole surface; as in the Cotton: or these hairs occupy one or both ends, when they constitute what is called the *coma* [215 m]. This must not be confounded with pappus (398), which is calyx.



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636. The integuments are often expanded into wings, which are either single [215], or several[215 d], and appear intended to render seeds buoyant. Very often they are corky or spongy [215 h], and not unfrequently consist of spiral cells (26).

637. In the seed these membranes are called by various names, of which the most frequently used are *spermoderm* or *testa* for the primine; *mesosperm* for the secundine; and *endopleura* for the coat of the nucleus (531).

638. The mouth of the foramen (542) is often distinctly visible, and is named the *micropyle*; *Ex.* Pea.

639. The *raphe* [190] occupies one side of the seed in all cases in which it pre-existed in the primine; but it frequently becomes much ramified.

640. The raphe is in no way connected with fertilisation; its functions being apparently confined to maintaining a vascular connection between the placenta and the base of the nucleus, for the purpose of nourishing the latter.

641. Spiral vessels are found in the raphe and its ramifications.

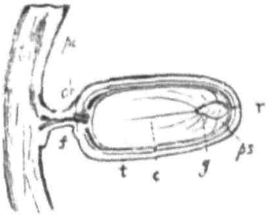
642. Where vessels of the raphe expand into the mesosperm (637), the *chalaza* (540) appears as a discoloured thickening of the integuments [215 i].

643. The micropyle always indicates the point in the circumference of a seed towards which the radicle (656) points.

644. And the chalaza is as constant an indication, when it is present, of the situation of the cotyledons (654); it being usually at that part of the circumference organically opposed to the radicle.

A good representation of the normal position of these parts is given in the following cut of Sterculia Balanghas [216], borrowed from A. de Jussieu's Cours Elémentaire. *p c* is a portion of the pericarp to which the seed is attached; *f* funi-

culus; *ch* chalaza and hilum, confounded, the seed being orthotropal (534); *t* integuments; *ps* albumen, existing in the form of small disc at the summit; *c* one of the cotyledons, the other having been removed to show the plumule *g*, and the radicle *r*.



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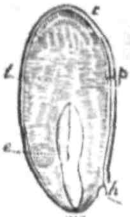

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645. Between the integuments and the embryo of some plants lies a substance called the *albumen* or *perisperm* [217].

646. It consists of a peculiar matter deposited during the growth of the ovule among the cellular tissue of the nucleus or of its integuments.

Although it appears that the albumen sometimes forms in the nucleus, sometimes in the integuments, and even, according to Schleiden, in the body of the chalaza, yet these differences have not been ascertained to possess any physiological importance.

647. When this cellular tissue combines with the deposited matter so completely as to form together but one substance, the albumen is called solid; *Ex.* Wheat, Euphorbia. When a portion of the tissue remains unconverted, the albumen is *ruminated*; *Ex.* Anona, Nutmeg.

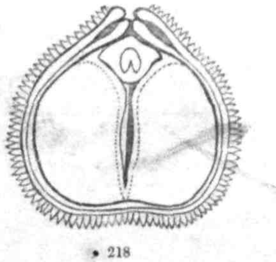
648. Albumen is usually wholesome, and may be sometimes eaten with impunity in dangerous tribes; *Ex.* Omphalococca, a genus of Spurgeworts.

649. It appears to be a natural provision for the supply of organisable food to the embryo at the period of germination. In its absence the cotyledons appear to perform its functions.

650. The organised body that lies within the seed, and for the purpose of protecting and nourishing which the seed was created, is the *Embryo* [217, 219].

651. The embryo was originally included within the sac of the amnios (546).

652. The latter is usually absorbed or obliterated during the advances of the embryo to maturity; but it sometimes remains surrounding the ripe embryo, in the form of *Vitellus* [218].



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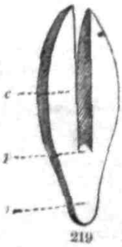

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653. The embryo [219] consists of the cotyledons (654), the radicle (656), the plumule (655), and the collar (657).

654. The *cotyledons* represent undeveloped leaves [219 e].

655. The *plumule*, or *gemmule*, is the nascent ascending axis [219 p].

656. The *radicle* is the rudiment of the descending axis (131) [219 r].

657. The *collar* is the line of separation between the radicle and the cotyledons.

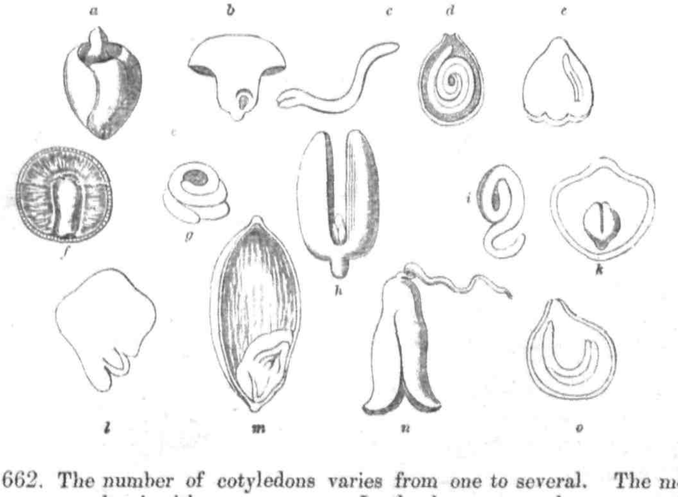
658. The space that intervenes between the collar and the base of the cotyledons is called the *cauliculus* (Tigelle, *Fr.*).

659. In some seeds the embryo is furnished with a *suspensor* (560) from the point of the radicle [220 n].

660. The embryo is usually solitary in the seed, but occasionally there are two or several.

661. When several embryos are produced within a single seed, it sometimes happens that two of these embryos grow together, in which case a production analogous to animal dicephalous monsters is formed.

In form, position, and direction, the embryo varies in different species. In general it is straight; in some it is spiral [220 d]; in others heliacal [g]; in others vermicular [c]; in others arcuate [o]. It usually occupies the axis of the albumen or seed: but it is also excentrical [e]; and unilateral [m]. In direction, it is either erect with respect to the seed, or inverted or transverse.



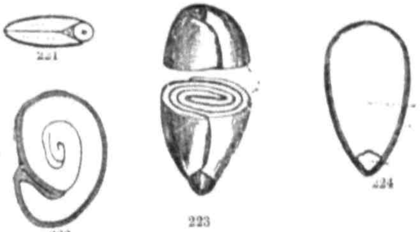
662. The number of cotyledons varies from one to several. The most common number is either one or two. In the latter case, they are usually directly opposite each other.

The cotyledons are semiterete [220 h]; foliaceous [215 e]; flat, convolute [220 a]; parallel with each other, or divergent [220 n]. When there is but one cotyledon, it often assumes peculiar forms: it is, for instance, fungous [220 b]; spheroidal [220 l]; lenticular [220 m].

663. The embryo is folded in a great varietv of ways, and its several parts undergo many degrees of development, of which systematical Botanists avail themselves, but which appear to be unconnected with physiological differences.

Thus in the Pomegranate [223] the embryo is straight, with great thin convolute cotyledons; in the cyclical embryo of the Caperbush [222] the radicle is very long, and the cotyledons very small thin. and flat; and in the Wallflower [221] the

cotyledons are large, plano-convex, and placed parallel with the radicle, which is bent down upon them.



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664. The direction of the embryo, with respect to the seed, will depend upon the relation that the integuments, the raphe, chalaza, hilum, and micropyle, bear to each other.

665. If the nucleus be inverted, the embryo will be erect, or *orthotropal;* *Ex.* Apple.

666. If the nucleus be erect, the embryo will be inverted, or *antitropal;* *Ex.* Nettle.

667. If the micropyle is at neither end of the seed, the embryo will be neither erect nor inverted, but will be in a more or less oblique direction with respect to the seed ; *Ex.* Primrose ; and is said to be *heterotropal.*

These must not be confounded with similar terms applied to the ovule (532), and consequently to the seed itself.

668. Plants that have but one cotyledon, or, if two, having the cotyledons alternate with each other, are called MONOCOTYLEDONOUS [220 f].

669. Plants that have two opposite each other, or a greater number placed in a whorl, are called DICOTYLEDONOUS.

670. Plants that have no cotyledons are said to be ACOTYLEDONOUS [220 g] ; but this term is usually applied only to cellular plants, which, having no sexual apparatus, can have no seeds (625).

671. Those seeds of flowering plants which appear to have no cotyledons, owe their appearance to the cotyledons being consolidated ; as in Tropæolum : or undeveloped, as in Cuscuta, Echinocactus, &c.

672. The plumule is often latent, until it is called into action by the germination of the seed. Sometimes it is undistinguishable from the cotyledons ; sometimes it is highly developed, and lies in a furrow of the cotyledon ; *Ex.* Maize [220 m]. In the monocotyledonous embryo, it frequently happens that the plumule is rolled up in the cotyledon, the margins of which grow together, so that the whole embryo forms one uniform mass [220 f] ; but as soon as germination commences the margins separate.

Among the various forms of the closed monocotyledonous embryo the cylindrical is the most common, but it is often lenticular [224], and sometimes mushroom-shaped [220 b].

XXII.—OF GERMINATION.

673. In its dormant state a seed may be regarded as a highly carbonised body, possessing vitality, and capable of growing into a plant.

674. If its chemical elements are combined in a stable form, this vitality may be suspended, under fitting circumstances, for an indefinite period.

Hence the power of enduring for centuries, which has been found to exist in seeds consisting chiefly of starch. This would seem to be true, even when seeds are exposed to a very low temperature. Edwards and Colin found that wheat, barley, rye, and beans exposed to a temperature low enough to freeze mercury, yet retained their vitality.

675. If its chemical elements are unstably combined, then vitality is quickly lost.

This seems to be the case with oily seeds more especially ; in consequence of their absorbing oxygen greedily, their chemical condition changes, and vitality disappears.

676. It is probable, though not proved, that in an atmosphere of carbonic acid the vitality of seeds might be maintained for an indefinite period.

677. Where a seed is exposed to favourable circumstances, it begins to grow, which is the act of *germination*.

678. These circumstances are, access to *air* and *moisture*, and *heat*, that is to say, a temperature above 32°, but which varies with species.

679. Water enables the parts to soften ; it also furnishes oxygen by its decomposition under the vital force of the embryo.

680. Air furnishes a further supply of oxygen, and nitrogen.

681. Heat excites the vitality of the embryo, and enables it to effect the chemical changes necessary for its further development.

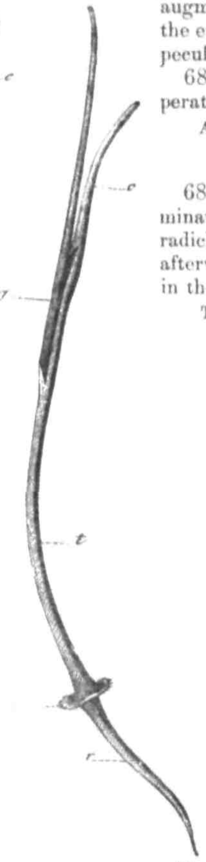
These four last propositions are established by daily experience, and by the admirable experiments of Edwards and Colin, Théodore de Saussure, and others. The former proved, that, although excessive cold would not kill seeds (674), yet that common cereal crops would not grow in earth above 115°. Hence the soil of tropical countries, in the dry season, when it rises to even 140° (Humboldt), would be fatal to such seeds. Every gardener knows, on the other hand, that tropical seeds will not germinate in the open ground of England ; nor elsewhere, except a temperature of from 70° to 84°, or even 90°, be steadily applied to them. With regard to the changes produced on atmospheric air by germinating seeds, the following experiments of Théodore de Saussure are conclusive :—

	Condition of the Atmosphere.			
	Before the Experiment.		After Germination.	
WHEAT.	Nitrogen	148·84	Nitrogen	148·32
	Oxygen	39·86	Oxygen	37·44
			Carbonic Acid	2·47
KIDNEY BEANS.	Nitrogen	151·41	Nitrogen	150·44
	Oxygen	40·24	Oxygen	31·26
			Carbonic Acid	9·53
HORSE BEANS.	Nitrogen	210·26	Nitrogen	209·41
	Oxygen	56·29	Oxygen	44·38
			Carbonic Acid	11·27

682. As different plants demand different degrees of heat in order to

germinate, it is probable that temperature is one of the main causes of limiting the geographical range of species.

683. The result of these chemical changes is a formation of gum or sugar, the diminution of carbon, by the extrication of CO_2, and the augmentation of nitrogen; till at last the embryo acquires the chemical state peculiar to growing vegetation.

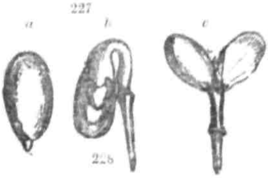


684. During these processes temperature rises.

And thus the natural heat of the atmosphere in which seeds germinate is augmented.

685. When a seed begins to germinate, the embryo first lengthens its radicle, then its caulicle (658), and afterwards sends its plumule upwards in the form of a stem and leaves.

This is apparently connected with the search for food. The radicle, which



is formed first (561), is therefore the oldest part, and may be the most excitable. Its purpose being to obtain food from the soil for the support of the nascent plant, the first energy of vegetation is directed towards pushing it into contact with the soil, so that it may be ready to act by the time the organisable matter stored up in the seed itself shall have been exhausted.

686. The radicle extends downwards, either directly from the base of the embryo, or after previously rupturing the integument of the base. Plants with the first character are called *exorhizal* [225]; with the second, *endorhizal* [226 227].

Fig. 228.—Three periods of growth in the seed of Acacia Julibrissin: *a* the first swelling of the embryo; *b* the emission of roots and extension of a caulicle; *c* the straightening of the axis and the appearance of a plumule. Fig. 225.—The exorhizal germination of an Ashleaved Maple, the lower figure in a more advanced state. Fig. 226.—The endorhizal germination of Zannichellia palustris. In these two figures *c* is the cotyledons; *g* the plumule; *t* the caulicle; and *r* the root: *m* is the collar, or medial line. Fig. 227.—The endorhizal germination of Wheat, with the sheaths or coleorhizæ, *c*, out of which the roots proceed.

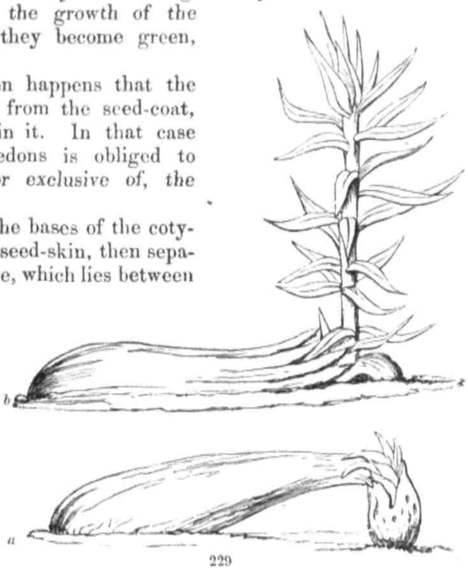
687. The endorhizal embryo is very common in monocotyledons ; the exorhizal, in dicotyledons.

688. In most plants the cotyledons are gradually raised above the surface of the ground by the growth of the caulicle[225], after which they become green, and act as leaves.

689. But it also often happens that the cotyledons never escape from the seed-coat, but remain buried within it. In that case the base of the cotyledons is obliged to *lengthen as well as, or exclusive of, the* caulicle.

690. In dicotyledons the bases of the cotyledons extend beyond the seed-skin, then separate, and allow the plumule, which lies between them, to rise perpendicularly[229].

691. In Endogens, on the contrary, the lengthened base of the cotyledon contains concealed within it both radicle and plumule, which eventually burst through its sides[230 231].



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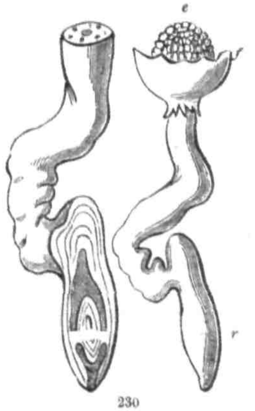
692. An appearance analogous to the last occasionally occurs in dicoty-



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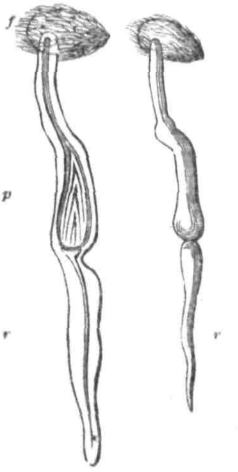

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Fig. 229.—*a* Seed of Araucaria protruding the bases of the cotyledons ; *b* the same, older, with the plumule risen up.

Figs. 230 and 231.—Germination of two Palms: *e* their embryo ; *f* the fruit ; *p* the plumule ; *r* the radicle. Both are shown as seen externally, and divided longitudinally.

ledons, as in Trapa [232], when what appears to be a caulicle is protruded, and finally seems to emit a plumule from its sides. But in reality the seeming caulicle is the base of one large cotyledon, the seeming plumule is an abortive second cotyledon ; so that here there is no other difference from the germination of dicotyledons than what depends upon the small size of the second cotyledon.

232

Fig. 232.—Fruit of Trapa natans, where seed is germinating in the interior, and has protruded a radicle and second cotyledon at the base of a larger.

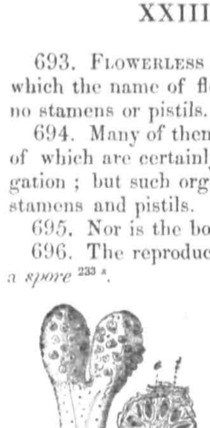
XXIII.—OF FLOWERLESS PLANTS.

693. FLOWERLESS plants are so called because they do not bear organs to which the name of flower (341) strictly applies ; that is to say, they have no stamens or pistils.

694. Many of them possess, however, two or more kinds of organs, some of which are certainly, and others possibly, concerned in the act of propagation ; but such organs are constructed upon a totally different plan from stamens and pistils.

695. Nor is the body formed by their co-operation an embryo (558).

696. The reproductive body by which flowerless plants are increased is a *spore* [233 s].



697. A spore is a cellular body, of a spheroidal form, producing root and stem indifferently from any part of its surface, according to the influence that is exercised upon it.

698. That influence which causes a point of the spore to lengthen into a stem is light ; that which causes the production of root is darkness.

In an embryo, on the contrary, growth takes place from fixed points, whose destiny no external influences can change. No amount of light would cause the radicle to become a stem, nor of darkness would compel the plumule to develop itself as a root.

699. For these reasons, flowerless plants have no seeds, strictly speaking.

700. When bodies supposed to be analogous to stamens and pistils appear, they are called *antheridia* and *pistillidia*, or *false anthers* and *false pistils*.

701. But great numbers of flowerless plants want antheridia ; as, for example, all Ferns and Thallogens.

It is said, indeed, that certain threads, called *paraphyses*[233 p], which often accompany spores, are male organs ; but this rests on no proof, and the lowest Thallogens are without even them.

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702. In Flowerless Plants, the organs of vegetation appear to perform the same functions as in flowering plants.

That is to say, the green parts decompose carbonic acid under the influence of light (317) ; the roots, when there is any, obtain food ; the stem separates leaves, if any are produced, and enables them to be exposed to light and air.

703. But their anatomical condition is in some respects different, and their external structure widely so.

704. They contain spiral vessels only in the higher orders of Acrogens.* But spiral threads are not uncommon among them, as in their antheridia, pistillidia, and even occasionally among Fungals ; *Ex.* Trichia.

* For the limits and characters of the orders of flowerless plants referred to in this chapter, the reader is requested to turn to the *Vegetable Kingdom*.

Fig. 233.—End of a frond of Fucus serratus ; *c* conceptacles ; *p* paraphyses ; *sp* spore in its skin or perispore ; *s* the spore naked.

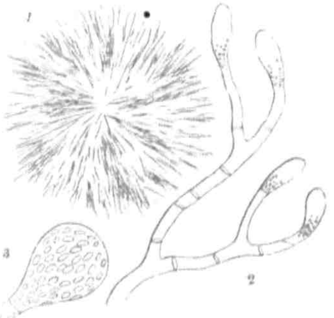
705. Their usual structure is merely cellular; their leaves, if they have any, being strengthened by longer and more slender cells.

706. In the class of Acrogens there is generally a stem or trunk, over which leaves are symmetrically disposed; and this occasionally acquires considerable size, as in the Ferns [234].

707. But even in Acrogens there is a great tendency on the part of many species to lose their symmetrical structure, and to blend stem and leaves into cellular irregular plates.

This is seen in Hymenophyllum and Trichomanes among Ferns, Salvinia in Pepperworts, Blasia, &c. among Scale-mosses, and in all Liverworts and Crystalworts. A similar tendency exists in flowering plants; for Podostemads among Exogens, and Lemnads in Endogens, are quite analogous to the plants just enumerated.

708. And in Thallogens no distinction of stem and leaf is discoverable in many thousand species, large numbers of which are mere congeries of filaments containing spores [235], or are even vesicular, as the whole race of Brittleworts.



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Here, however, a tendency to the separation of stem and leaves with a symmetrical arrangement is found in some Seaweeds and Rosetangles, and even in such Lichens as Cladonia perfilata; while Charas are absolutely symmetrical, though leafless.

709. Flowerless plants appear to exercise the same purifying influence as flowering plants (341) upon the medium in which they grow, absorbing carbonic acid, decomposing it, and liberating the oxygen.

710. Fungals, however, are said to form a striking exception to this rule; their functions being to absorb oxygen, and to liberate carbonic acid

Fig. 235.—Chionyphe or Snow mould. 1. Its filamentous condition; 2. One of the threads containing spores at the extremity; 3. The same more magnified.

in large quantities. They also contain a greater proportional quantity of nitrogen than other plants.

In the experiments of Marcet, it appears that Mushrooms, vegetating in atmospheric air, produce on that air very different modifications from those of green plants in analogous situations; in fact, that they vitiate the air promptly, either by absorbing its oxygen, to form carbonic acid at the expense of the carbon of the vegetable, or by disengaging carbonic acid formed in various ways. That the modifications which the atmosphere experiences when in contact with growing Mushrooms are the same, day and night. That if fresh Mushrooms are placed in an atmosphere of pure oxygen, a great part of that gas disappears at the end of a few hours. One portion of the oxygen which is absorbed combines with the carbon of the plant to form carbonic acid; whilst another part appears to be fixed in the vegetable, and to be replaced, at least in part, by nitrogen disengaged by the Mushroom. That when fresh Mushrooms remain some hours in an atmosphere of nitrogen, they modify very slightly the nature of that gas. The sole effect produced is confined to the disengagement of a small quantity of carbonic acid, and sometimes to the absorption of a very small quantity of nitrogen.

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711. The reproductive organs of flowerless plants vary according to the tribes of that division of the vegetable kingdom; and have so little apparent *relation to each other, that each principal tribe* may be said to have its own peculiar method of propagation.

712. We are not, however, to understand that the reproductive organs are not analogous throughout. All that the last proposition can be understood to mean is, that the analogies have not been clearly explained.

713. FERNS are increased by *spores*, inclosed within cases named *thecæ* or *spore-cases*, which often grow in clusters or *sori* from the veins of the under sides of the leaves, or from beneath the epidermis. The latter, when it incloses the spore-cases, is termed the *indusium*.

714. The spore-cases have frequently a stalk which passes up one side, and finally, curving with their curvature, disappears on the opposite side.

715. The part where the stalk of the spore-case is united with its side, is called the *annulus*.

716. These spore-cases may possibly be considered minute leaves, having the same gyrate mode of development as the common leaves of the order; their stalk the petiole, the annulus the midrib, and the theca itself the lamina, the edges of which are united.

717. They would therefore be analogous to carpels, if it appeared that they were influenced by the action of any vivifying matter, or had a placenta.

718. URN MOSSES are increased by spores contained within an *urn*, or spore-case, placed at the apex of a stalk or *seta*, bearing on its summit a loose hood, called a *calyptra*, and closed by a lid or *operculum*.

719. The inside of the theca has a central axis or *columella*, and the orifice beneath the operculum is closed by teeth-like processes, or a membrane called the *peristome*.

720. At the base of the spore-case is sometimes found a tumour or *struma*, or an equal expansion named *apophysis*.

721. The number of the teeth of the peristome is always some multiple of four.

722. The calyptra (718) originally grew from the base of the stalk; but when the stalk lengthened, the calyptra was torn away from its base and carried up, surrounding the spore-case.

723. The calyptra may be understood to be a convolute leaf; the oper-

culum, another; the peristome, one or more whorls of minute flat leaves; and the theca itself to be the excavated distended apex of the stalk, the cellular substance of which separates in the form of spores.

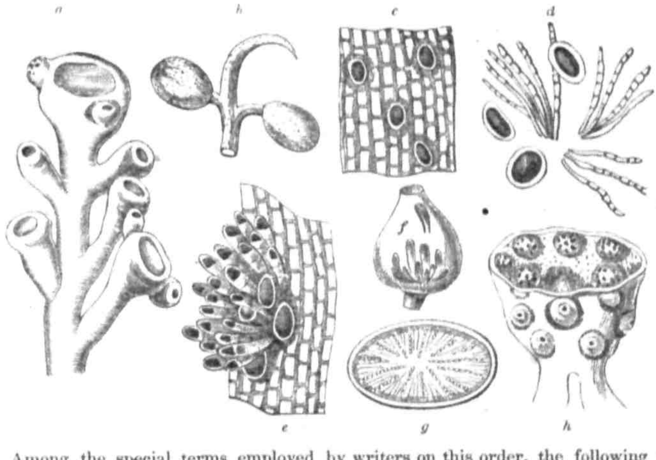
724. LICHENS are mere cellular expansions, usually horizontal, but occasionally perpendicular, consisting of a *thallus*, or combination of stem and leaves, upon which *shields*, *apothecia*, or reproductive organs, appear.

725. The shields consist of a margin, inclosing a kernel, *nucleus*, in which tubes containing sporules, and called *asci*, are imbedded.

726. ALGALS are submersed plants, equally destitute of any kind of tissue except the cellular, and propagated by spores lodged in various parts of the system.

727. The spores either lie freely in the whole substance of such plants, or are collected in particular cells [236 c], or occupy jointed filaments [e], or are placed in spherules [b], occupying the circumferences of expansions of the thallus (724).

728. There are also other modes of multiplication.



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Among the special terms employed by writers on this order, the following may be enumerated as the principal. Among their reproductive organs are *gongyli*, or hard round deciduous bodies; *granula*, or large spores; *sporidia*, or bodies resembling spores, but not such; *sporangia* or *coniocysta*, or spore-cases [236 b f]. *Hypha* is a filamentous thallus; *phycomater* is the gelatine in which the spores of some begin to vegetate; *peridiolum* is a membrane immediately covering the spores; *vesiculæ* are air-bladders that enable some species to float.

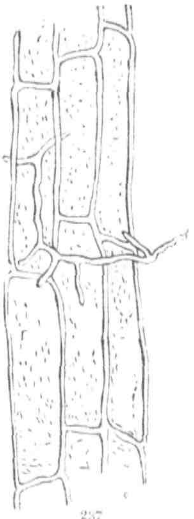
729. FUNGALS, which are among the lowest forms of vegetation, are also cellular, some of their cells however containing spiral threads; and they are propagated by spores.

730. In the highest forms, two kinds of organs are detected [239]: one, *cystidia*, are conical naked elevations; the other, *basidia*, are also conical elevations, but they bear spores in definite number on their apex.

731. The highest forms of the fungal alliance consist of a *volva*, a *stipes*, an *annulus* or *collar*, a *pileus* or *cap*, and an *hymenium* [238].

732. Lower forms are reduced to a mere integument, containing the reproductive system.

733. They all originate in filaments, produced by the spores, and called *mycelium*, or *spawn* [237].



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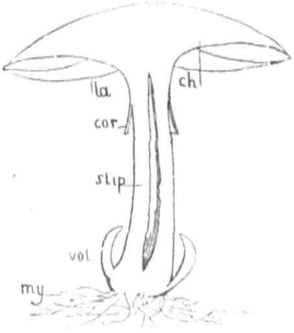

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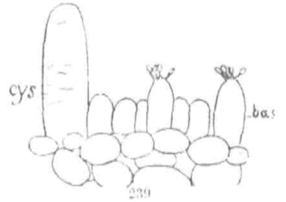

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734. Mycelium is often intestinal, in which case it penetrates among the tissue of both animals and plants, whether living or dead.

735. If alive, it destroys or greatly weakens vitality.

736. If the tissue in which it roots is dead, the mycelium rapidly increases the decomposing process, perhaps in consequence of the nitrogen it conveys.

737. Some have the sporules inclosed in *asci*.

738. The lowest consist of nothing but cells, usually placed end to end, and inclosing spores or sporules in the terminal cells.

NOTE.—This rapid sketch gives a most imperfect idea of the peculiarities of flowerless plants. But they do not much occupy the attention of mere students; and as each alliance demands a special and very careful study of the authors who have treated of it, the details of its structure can only be learned advantageously from such authors. It must, however, be confessed that writers upon flowerless plants have manifested little of that power of generalizing which has been so eminently displayed by the great investigators of the structure of flowering plants. Hence there is no agreement among the terms employed, but the whole terminology is a sad chaos, which will only be dispelled when some talented comparative an-tomist shall have applied himself to the task of thoroughly reconstructing it. *See the Vegetable Kingdom*, classes THALLOGENS and ACROGENS. It is to be hoped that the labours of Mohl, Karl Müller, and some others, are paving the way to this result.

Fig. 237.—Magnified view of the cellular tissue of wheat straw, traversed by the mycelium of Uredo caries, *Berkeley*.

Fig. 238.—A section of an Agaric; *my* mycelium; *vol* volva; *stip* stipes; *cor* annulus; *la* lamellar hymenium; *ch* pileus.

Fig. 239.—Highly magnified view of the basidia and cystidia proceeding from the hymenium of an Agaric (730).

SCHOOL BOTANY.

SYSTEMATICAL BOTANY is the science of arranging plants in such a manner that their names may be ascertained, their affinities determined, their true place in a natural system fixed, their sensible properties judged of, and their whole history elucidated with certainty and accuracy.

Anything short of this is not a system, but an artificial scheme.

The latter is intended to enable a person to ascertain the name of a plant, and goes no further.

But as the name of a plant by itself conveys no information, the power thus acquired by artificial schemes is of but little value, and can only be considered a very imperfect and elementary mode of investigation.

The knowledge gained by the use of an artificial scheme consists of isolated facts, without mutual dependence, or any distinct bearing upon general views.

In a natural arrangement, on the other hand, the name of a plant is the least object that is gained. This study necessarily leads to an extensive knowledge of structure, strengthens the perceptive powers, and accustoms the mind to habits of careful generalization. It more especially leads to the consideration of the relationship one plant bears to another; and as plants which are most closely akin in structure are also most similar in their sensible properties, it often enables men to judge of the use of an unknown plant by the ascertained properties of those species in whose vicinity it takes its place by virtue of its natural affinities.

A full account of all the principal natural systems of classification will be found in the "Vegetable Kingdom." *

The only artificial schemes in general use are, 1, that of Linnæus, called the SEXUAL System, in consequence of its characters being dependent upon variations in the stamens and pistil, or sexes of plants; and 2, the ANALYTICAL method.

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* *The Vegetable Kingdom; or, the Structure, Classification and Uses of Plants, illustrated upon the Natural System;* with upwards of 500 illustrations. By John Lindley. 8vo. Second Edition. 1846.

I.—THE SEXUAL SYSTEM.

This is now disused by men of science; but, as many books have been arranged upon its plan, it is convenient for a student to understand it.

Its divisions, called classes and orders, depend upon modifications of the stamens and pistils, and have Greek names expressive of their distinctive characters.

Class 1. Monandria. *Stamen* 1.
2. Diandria. *Stamens* 2.
3. Triandria. *Stamens* 3.
4. Tetrandria. *Stamens* 4.
5. Pentandria. *Stamens* 5.
6. Hexandria. *Stamens* 6.
7. Heptandria. *Stamens* 7.
8. Octandria. *Stamens* 8.
9. Enneandria. *Stamens* 9.
10. Decandria. *Stamens* 10.
11. Dodecandria. *Stamens* 12—19.
12. Icosandria. *Stamens* 20 or more, perigynous (429).
13. Polyandria. *Stamens* 20 or more, hypogynous (428).

Orders. Each of these classes is divided into orders characterised by the number of styles or sessile stigmas. Monogynia signifies 1 *style*; Digynia, 2; Trigynia, 3; Tetragynia, 4; Pentagynia, 5; Hexagynia, 6; Heptagynia, 7; Octogynia, 8; Enneagynia, 9; Decagynia, 10; Dodecagynia, &c. about 12; Polygynia, a great many.

Class 14. Didynamia: *Stamens* 4, two long and two short. *Orders:* 1. Gymnospermia, seeds apparently naked; 2. Angiospermia, seeds evidently in a seed-vessel.

Class 15. Tetradynamia: *Stamens* 6, four long and two short. *Orders:* 1. Siliquosa, with a long pod; 2. Siliculosa, with a short pod or pouch.

Class 16. Monadelphia: Filaments united into a cup or column. *Orders:* 1. Pentandria; 2. Decandria, &c. as before.

Class 17. Diadelphia: Filaments united into two parcels or fraternities. *Orders:* 1. Hexandria, &c. as before.

Class 18. Polyadelphia: Filaments united into more parcels than two. *Orders:* 1. Dodecandria; 2. Icosandria, &c. as before.

Class 19. Syngenesia: *Anthers* united into a tube. *Orders:* 1. Monogamia, flowers solitary; 2. Polygamia, flowers in heads. *Sub-orders* of the latter: 1. Æqualis, florets all equal; 2. Superflua, florets of the disk complete, of the ray female; 3. Frustranea, florets of the disk complete, of the ray neuter; 4. Necessaria, florets of the disk male, of the ray female; 5. Segregata, florets each with its own proper involucre.

Class 20. Gynandria: Stamens and styles consolidated. *Orders:* 1. Monandria, &c. as before.

Class 21. Monœcia : Stamens in one flower, pistils in another, on the same plant. *Orders :* 1. Monandria, &c. as before.

Class 22. Diœcia : Stamens in one flower, pistils in another, on different plants. *Orders :* 1. Monandria, &c. as before.

Class 23. Polygamia : Stamens and pistils separate in some flowers, united in others, either on the same plant or on two or three different ones. *Orders :* 1. Monœcia, &c. as before.

Class 24. Cryptogamia : no apparent flowers. *Orders :* Filices, Musci, Hepaticæ, Algæ, Fungi. It comprehends all the plants now stationed among Thallogens and Acrogens, and commonly called flowerless (693).

II.—ANALYTICAL METHOD.

This is founded upon the common process of analysis that is unconsciously employed by the human mind. In all cases the mental operation by which one thing is distinguished from another, consists in a continual contrast of characters. For instance, in a mass of individuals we distinguish one set that is coloured, and another that is colourless; of those which are coloured we distinguish red, black, blue, and green; of the red, some are square, others are round; of the round, some are sculptured on their surface, others are even:—and so we proceed, analysing the subject by a constant series of contrasts, until we have arrived at a point beyond which no analysis can go.

The following pages contain such an analysis of the principal natural orders of plants. The method may be equally applied to genera and species, and is an instructive process if employed by way of exercise to the mind, and for the purpose of rendering distinctions definite. It purposely contains some of the orders now merged in others, and is drawn up from other characters than those employed in the "Vegetable Kingdom," in order to vary the means of study which may be within a Student's reach. Many other modes of constructing it might be adopted with equal propriety.

1. Plants with visible flowers and a stem 2
   Plants with visible flowers and a thallus . . RHIZANTHS.
   Plants without flowers . . 261
2. Leaves netted. Wood in concentric layers 3
   Leaves straight-veined. Wood confused . . . 239
   Leaves straight-veined. Wood in concentric layers . . 237
3. Flowers having both calyx and corolla. 4
   Flowers having a calyx only, or none 119
4. Petals distinct 5
   Petals united . . . 186
5. Stamens more than 20 . . 6
   Stamens fewer than 20 . . 36
6. Ovary inferior, or partially so . 7
   Ovary superior . . . 15
7. Leaves furnished with stipules . 8
   Leaves without stipules . . 10
8. Carpels more or less disunited POMACEÆ.
   Carpels consolidated . . 9
9. Placenta central LECYTHIDACEÆ.
   Placenta parietal . HOMALIACEÆ.
10. Carpels distinct . ANONACEÆ.
    Carpels consolidated . . 11
11. Placenta spread over the septa NYMPHÆACEÆ.
    Placenta parietal . . 12
    Placenta in the axis . . 13
12. Petals definite in number LOASACEÆ.
    Petals indefinite . CACTACEÆ.
13. Leaves with transparent dots MYRTACEÆ.
    Leaves dotless . . . 14
14. Petals indefinite . MESEMBRYACEÆ.
    Petals definite . PHILADELPHACEÆ.
15. Leaves with stipules . . 16
    Leaves without stipules . . 24
16. Carpels disunited . . . 17
    Carpels consolidated . . 18
17. Stamens hypogynous MAGNOLIACEÆ.
    Stamens perigynous . ROSACEÆ.
18. Placenta parietal . BIXACEÆ.
    Placenta in the axis . . 19
19. Æstivation of calyx imbricated . 20
    Æstivation valvate . . 22
20. Flowers unisexual EUPHORBIACEÆ.
    Flowers hermaphrodite . . 21
21. Ovary one-celled . PORTULACACEÆ.
    Ovary with more cells than one CISTACEÆ.

22. Calyx enlarged and irregular DIPTERACEÆ.
Calyx not enlarged . . 23
23. Stamens monadelphous MALVACEÆ.
Stamens distinct . TILIACEÆ.
24. Carpels disunited or solitary . 25
Carpels consolidated . . 30
25. Carpels plunged in a tabular disk NELUMBIACEÆ.
Carpels clear of the disk . 26
26. Stamens perigynous . ROSACEÆ.
Stamens hypogynous . . 27
27. Carpel solitary . ANACARDIACEÆ.
Carpels several . . . 28
28. Stamens polyadelphous HYPERICACEÆ.
Stamens free . . . 29
29. Herbs . RANUNCULACEÆ.
Trees or Shrubs . ANONACEÆ.
30. Placentas in the axis . . 31
Placentas parietal . . 34
Placentas dissepimental NYMPHÆACEÆ.
31. Stigma large, umbrella-shaped SARRACENIACEÆ.
Stigma simple . . . 32
32. Sepals 2 . . PORTULACACEÆ.
Sepals more than 2 . . 33
Sepals united into a tube LYTHRACEÆ.
33. Petals flat, seeds few, leaves leathery . . CLUSIACEÆ.
Petals crumpled, seeds numerous, leaves membranous . CISTACEÆ.
Petals flat, stamens monadelphous HUMIRIACEÆ.
34. Placentas spread over the lining of the fruit . FLACOURTIACEÆ.
Placentas in lines . . 35
35. Ovary stalked . CAPPARIDACEÆ.
Ovary sessile . PAPAVERACEÆ.
36. Ovary more or less inferior . 37
Ovary quite superior . . 35
37. Leaves with stipules . . 38
Leaves without stipules . . 41
38. Flowers unisexual . BEGONIACEÆ.
Flowers hermaphrodite . . 39
39. Placentas parietal . HOMALIACEÆ.
Placentas in the axis . . 40
40. Calyx valvate, stamens opposite the petals . . RHAMNACEÆ.
Calyx imbricate, stamens alternate with petals HAMAMELIDACEÆ.
41. Placentas parietal . . 42
Placentas axile . . . 43
42. Flowers unisexual CUCURBITACEÆ.
Flowers hermaphr. or polyg. GROSSULACEÆ.
43. Disk double . . APIACEÆ.
Disk simple . . . 44
44. Seeds few . . . 45
Seeds numerous . . . 5.
45. Carpels solitary . . . 46
Carpels several . . . 48
46. Parasites on trees . LORANTHACEÆ.
Root plants . . . 47
47. Leaves balsamic, acrid ANACARDIACEÆ.
Leaves insipid . COMBRETACEÆ.
48. Calyx valvate . . . 49
Calyx imbricated . . 50
49. Stamens opp. petals . RHAMNACEÆ.
Stamens altern. petals . CORNACEÆ.
50. Anthers curved downwards MEMECYLACEÆ.
Anthers erect . BRUNIACEÆ.
51. Leaves dotted . . MYRTACEÆ.
Leaves not dotted . . 52
52. Anthers curved downwards MELASTOMACEÆ.
Anthers erect . . . 53
53. Flowers tetramerous . ONAGRACEÆ.
Flowers not tetramerous . . 54
54. Petals always distinct SAXIFRAGACEÆ.
Petals first united into a tube ESCALLONIACEÆ.
55. Leaves with stipules . . 56
Leaves without stipules . . 81
56. Carpels disunited . . 57
Carpels consolidated . . 59
57. Anther valves recurved BERBERIDACEÆ.
Anther valves straight . . 58
58. Fruit leguminous . FABACEÆ.
Fruit drupaceous or capsular ROSACEÆ.
59. Placentas parietal . . 60
Placentas in the axis . . 62
60. Flowers with a coronet PASSIFLORACEÆ.
Flowers without a coronet . 61
61. Leaves circinate when young DROSERACEÆ.
Leaves straight when young VIOLACEÆ.
62. Flowers unisexual EUPHORBIACEÆ.
Flowers hermaphrodite or polyg. 63

63. Sepals 2 . . PORTULACEÆ.
Sepals more than 2 . . 64
64. Fruit with a long beak . GERANIACEÆ.
Fruit without a beak . . 65
65. Styles distinct to the base . 66
Styles more or less united . 72
66. Petals minute . . . 68
Petals conspicuous . . 69
68. Stigmas capitate . ELATINACEÆ.
Stigmas simple . ILLECEBRACEÆ.
69. Calyx valvate . ELÆOCARPACEÆ.
Calyx imbricated . . 70
70. Stamens hypogynous MALPIGHIACEÆ.
Stamens perigynous . . 71
71. Leaves opposite . CUNONIACEÆ.
Leaves alternate . SAXIFRAGACEÆ.
72. Calyx imbricated . . 73
Calyx valvate or open . . 77
73. Stamens monadelphous OXALIDACEÆ.
Stamens distinct . . 74
74. Calyx surrounded with double glands . . MALPIGHIACEÆ.
Calyx simple . . . 75
75. Leaves simple . ZYGOPHYLLACEÆ.
Leaves compound . . 76
76. Flowers unsymmetrical SAPINDACEÆ.
Flowers symmetrical STAPHYLEACEÆ.
77. Stamens opposite the petals . 78
Stamens alternate with petals . 79
78. Stamens perigynous . RHAMNACEÆ.
Stamens hypogynous . VITACEÆ.
79. Anthers opening by pores ELÆOCARPACEÆ.
Anthers opening by slits . 80
80. Petals split . CHAILLETIACEÆ.
Petals undivided . BURSERACEÆ.
81. Carpels disunited . . 82
Carpels consolidated . . 93
82. Anthers with recurved valves BERBERIDACEÆ.
Anthers with straight valves . 83
83. Fruit leguminous . . 84
Fruit not leguminous . . 85
84. Radicle next hilum . FABACEÆ.
Radicle remote from hilum CONNARACEÆ.
85. Leaves dotted . AMYRIDACEÆ.
Leaves not dotted . . 86
86. Carpels solitary . ANACARDIACEÆ.
Carpels several . . 87
87. Carpels with hypog. scales . 88
Carpels without ditto . . 89
88. Hypogynous scales simple CRASSULACEÆ.
Hypogynous scales double FRANCOACEÆ.
89. Herbaceous plants RANUNCULACEÆ.
Trees or shrubs . . 90
90. Flowers unisexual MENISPERMACEÆ.
Flowers hermaphrodite . 91
91. Stamens perigynous CALYCANTHACEÆ.
Stamens hypogynous . . 92
92 Stamens indefinite . ANONACEÆ.
Stamens definite . CORIARIACEÆ.
93. Placenta dissepimental NYMPHÆACEÆ.
Placenta parietal . . 94
Placenta axile . . . 99
94. Stamens tetradynamous BRASSICACEÆ.
Stamens not tetradynamous . 95
95. Hypogynous disk large . 96
Hypogynous disk small or 0 . 97
96. Stamens indefinite CAPPARIDACEÆ.
Stamens definite . RESEDACEÆ.
97. Sepals tubular . FRANKENIACEÆ.
Sepals distinct . . . 98
98. Sepals 2-3 . . PAPAVERACEÆ.
Sepals 5 . . TURNERACEÆ.
99. Brown parasites MONOTROPACEÆ.
Green rooting plants . . 100
100. Styles distinct . . . 101
Styles consolidated . . 105
101. Stam. polyadelphous HYPERICACEÆ.
Stamens free . . . 102
102. Carpels with an hypogynous scale. . CRASSULACEÆ.
Carpels without do. . . 103
103. Carpels two divaricating SAXIFRAGACEÆ.
Carpels parallel . . 104
104. Stigmas capitate . LINACEÆ.
Stigmas simple CARYOPHYLLACEÆ.
105. Stamens monadelphous . 106
Stamens free . . . 107
106. Seeds wingless . MELIACEÆ.
Seeds winged . . CEDRELACEÆ.
107. Sepals 2 . PORTULACACEÆ.
Sepals more than 2 . . 108
108. Anthers opening by pores ERICACEÆ.
Anthers opening by slits . 109

109. Leaves dotted . . 110
Leaves not dotted . . 112
110. Fruit succulent Aurantiaceæ.
Fruit capsular . . . 111
111. Flowers hermaphrodite Rutaceæ.
Flowers polygamous Xanthoxylaceæ.
112. Flowers irregular Balsaminaceæ.
Flowers regular . . 113
113. Stamens arising from scales Simarubaceæ.
Stamens not do. . . 114
114. Calyx valvate . . 115
Calyx imbricated . . 116
115. Stam. opposite petals Rhamnaceæ.
Stamens more numerous than petals . Lythraceæ.
116. Flowers unisexual Empetraceæ.
Flowers hermaphrodite . 117
117. Stamens hypogynous . . 118
Stamens perigynous Celastraceæ.
118. Seeds comose . Tamaricaceæ.
Seeds naked . Pittosporaceæ.
119. Calyx none . . . 120
Calyx present . . . 128
120. Leaves with stipules . . 121
Leaves without stipules . 126
121. Ovules numerous Silicaceæ.
Ovules few . . . 122
122. Flowers hermaphrodite . 123
Flowers unisexual . . 124
123. Stam. unilateral Chloranthaceæ.
Stamens whorled Saururaceæ.
124. Carpels triple Euphorbiaceæ.
Carpels single . . . 125
125. Ovule erect . Myricaceæ.
Ovule pendulous Platanaceæ.
126. Flowers hermaphrodite Piperaceæ.
Flowers unisexual . . 127
127. Carpels single . Myricaceæ.
Carpels double Callitrichaceæ.
128. Ovary inferior . . 129
Ovary superior . . 143
129. Leaves with stipules . . 130
Leaves without stipules . 132
130. Flowers hermaphrodite Aristolochiaceæ.
Flowers unisexual . 131
131. Flowers amentaceous Corylaceæ.
Flowers not do. • Begoniaceæ.
132. Flowers unisexual . . 133
Flowers herm. or polyg. . 136
133. Climbing tendrilled herbs Cucurbitaceæ.
Trees or shrubs . . 134
134. Leaves compound Juglandaceæ.
Leaves simple . . 135
135. Leaves opposite Garryaceæ.
Leaves alternate Myricaceæ.
136. Leaves dotted . . Myrtaceæ.
Leaves not dotted . . 137
137. Ovary 1-celled . . 138
Ovary 2-6-celled . . 142
138. Parasites on branches Loranthaceæ.
Terrestrial . . . 139
139. Flowers $\sqrt[2]{}$. Onagraceæ
Flowers not $\sqrt[2]{}$ . . . 140
140. Calyx valvate . Santalaceæ.
Calyx not valvate . . 141
141. Embryo straight Combretaceæ.
Embryo curved Chenopodiaceæ.
142. Flowers $\sqrt[4]{}$. Onagraceæ.
Flowers $\sqrt[3]{}$ Aristolochiaceæ.
143. Leaves with stipules . . 144
Leaves without stipules . 160
144. Flowers hermaphrodite . 145
Flowers unisexual . . 147
145. Sepals 2 . Portulacaceæ.
Sepals more than 2 . . 146
146. Carpels more than 1 consolidated 147
Carpels solitary . . 153
147. Stamens hypogynous . . 148
Stamens perigynous . . 150
148. Fruit beaked . Geraniaceæ.
Fruit not beaked . . 149
149. Calyx biglandular imbricated Malpighiaceæ.
Calyx eglandular valvate Tiliaceæ.
150. Placenta parietal Passifloraceæ.
Placenta axile . . . 151
151. Leaves opposite Cunoniaceæ.
Leaves alternate . . 152
152. Calyx valvate . Rhamnaceæ.
Calyx imbricate . Ulmaceæ.
153. Calyx membranous Illecebraceæ.
Calyx firm and herbaceous . 154
154. Styles from the base of ovary Chrysobalanaceæ.
Styles terminal . . 155
155. Fruit leguminous . Fabaceæ.
Fruit not leguminous . . 156
156. Stipules ochreate Polygonaceæ.
Stipules simple or 0 . . 157

157. Styles simple . . ROSACEÆ.
Styles triple . PETIVERIACEÆ.
158. Carpels solitary URTICACEÆ.
Carpels more than one . . 159
159. Flowers amentaceous BETULACEÆ.
Flowers not amentaceous EUPHORBIACEÆ.
160. Flowers hermaphrodite . 161
Flowers unisexual . . 183
161. Sepals 2 . PORTULACACEÆ.
Sepals more than 2 . . 162
162. Carpels more than 2, consolidated 163
Carpels solitary, or disjoined . 172
163. Placenta parietal PAPAVERACEÆ.
Placenta axile . . . 164
164. Ovules few . . . 165
Ovules many . . . 168
165 Leaves dotted . . RUTACEÆ.
Leaves not dotted . . 166
166. Leaves compound . OLEACEÆ.
Leaves simple . . . 167
167. Carpels numerous, separable PHYTOLACCACEÆ.
Carpels few, inseparable CELASTRACEÆ.
168. Carpels 2, divaricating SAXIFRAGACEÆ.
Carpels not divaricating . 170
170. Stamens hypogynous CAROPHYLLACEÆ.
Stamens perigynous . . 171
171. Fruit one-celled PRIMULACEÆ.
Fruit many-celled LYTHRACEÆ.
172. Carpels several RANUNCULACEÆ.
Carpels solitary . . 173
173. Anther valves recurved LAURACEÆ.
Anther valves straight . . 174
174. Fruit a legume . FABACEÆ.
Fruit not do. . . . 175
175. Leaves dotted . AMYRIDACEÆ.
Leaves not dotted . . 176
176. Stamens within the points of sepals . PROTEACEÆ.
Stamens not do. . . 177
177. Calyx hardened . . 178
Calyx tube membranous . 179
178. Cal. all hardened SCLERANTHACEÆ.
Base only of cal. hardened NYCTAGINACEÆ.
179. Fruit triangular POLYGONACEÆ.
Fruit rounded . . 180
180. Leaves lepidote ELÆAGNACEÆ.
Leaves not lepidote . . 181
181. Calyx tubular THYMELACEÆ.
Calyx tubeless . . 182
182. Calyx dry and coloured AMARANTACEÆ.
Calyx herbaceous CHENOPODIACEÆ.
183. Carpels solitary or distinct . 184
Carpels consolidated . . 185
184. Calyx tubular, carpel solitary MYRISTACEÆ.
Calyx open, carpels several MENISPERMACEÆ.
185. Leaves dotted XANTHOXYLACEÆ.
Leaves not dotted EUPHORBIACEÆ.
186. Ovary superior . . 187
Ovary inferior . . 226
187. Flowers regular . . 188
Flowers irregular . . 218
188. Ovary deeply split . . 189
Ovary not split . . 192
189. Leaves dotted . . RUTACEÆ.
Leaves not dotted . . 190
190 Inflorescence gyrate BORAGINACEÆ.
Inflorescence straight . . 191
191. Æstivation plaited NOLANACEÆ.
Æstivation flat STACKHOUSIACEÆ.
192. Carpels 4, 5, or more . . 193
Carpels three . . . 204
Carpels two . . . 206
Carpels single . . . 216
193. Stamens opposite petals . 194
Stamens alternate with petals . 197
194. Shrubs or trees . MYRSINACEÆ.
Herbs . . PRIMULACEÆ.
195. Anthers opening by pores . 196
Anthers opening by slits . 198
196. Anthers one-celled EPACRIDACEÆ.
Anther two-celled . . 197
197. Shrubs. Seeds wingless ERICACEÆ.
Herbs. Seeds winged. PYROLACEÆ.
198. Brown parasites MONOTROPACEÆ.
Rooting plants . . . 199
199. Seeds numerous . CRASSULACEÆ.
Seeds few or solitary . . 200
200. Carpels distinct . ANONACEÆ.
Carpels consolidated . . 201
201. Ovules erect . . 202
Ovules pendulous . . 203
202. Æstivation imbricated SAPOTACEÆ.
Æstivation plaited CONVOLVULACEÆ.

203. Stamens twice as many as petals . EBENACEÆ.
Stamens equal to petals . AQUIFOLIACEÆ.
204. Inflorescence gyrate HYDROLEACEÆ.
Inflorescence straight . . 205
205. Calyx imbricated CONVOLVULACEÆ.
Calyx tubular . POLEMONIACEÆ.
206. Stamens 2 . . . 207
Stamens more than 2 . . 208
207. Corolla valvate . OLEACEÆ.
Corolla imbricate . JASMINACEÆ.
208. Inflorescence gyrate . . 209
Inflorescence straight . . 210
209. Fruit two-celled . CORDIACEÆ.
Fruit one-celled HYDROPHYLLACEÆ.
210. Corolla valvate . CESTRACEÆ.
Corolla imbricate . . 211
211. Anthers united to stigma ASCLEPIADACEÆ.
Anthers free . . . 212
212. Corolla contorted . APOCYNACEÆ.
Corolla imbricated or plaited . 213
213. Calyx broken-whorled . . 214
Calyx imbricated . . 215
214. Leafless twiners . CUSCUTACEÆ.
Leafy plants . CONVOLVULACEÆ.
215. Placentæ parietal . GENTIANACEÆ.
Placentæ axile . SOLANACEÆ.
216. Stigma with an indusium BRUNONIACEÆ.
Stigma without an indusium . 217
217. Style single . PLANTAGINACEÆ.
Styles 5 . . PLUMBAGINACEÆ.
218. Ovary 4-lobed . . LAMIACEÆ.
Ovary undivided . . 219
219. Carpel solitary . GLOBULARIACEÆ.
Carpels 2 . . . 220
220. Fruit nut-like . VERBENACEÆ.
Fruit capsular or succulent . 221
221. Placenta parietal OROBANCHACEÆ.
Placenta free, central LENTIBULACEÆ.
Placenta axile . . . 222
222. Seeds winged . BIGNONIACEÆ.
Seeds wingless . . 223
223. Placentæ double CYRTANDRACEÆ.
Placentæ simple . . 224
224. Ovary partly inferior GESNERACEÆ.
Ovary quite superior . . 225
225. Calyx broken-whorled ACANTHACEÆ.
Calyx tubular or imbricated SCROPHULARIACEÆ.
226. Carpel solitary . . 227
Carpels more than one . 229
227. Anthers syngenesious ASTERACEÆ.
Anthers free . . . 228
228. Flowers in heads . DIPSACEÆ.
Flowers loose . VALERIANACEÆ.
229. Anthers syngenesious LOBELIACEÆ.
Anthers free . . . 230
230. Anthers opening by pores VACCINACEÆ.
Anthers opening by slits . 231
231. Stipules between the leaves CINCHONACEÆ.
Stipules none . . . 232
232. Stigma with an indusium GOODENIACEÆ.
Stigma naked . . . 233
233. Seeds indefinite . . 234
Seeds few in number . . 235
234. Stamens free . CAMPANULACEÆ.
Stamens consolidated STYLIDIACEÆ.
235. Leaves alternate . EBENACEÆ.
Leaves opposite . . 236
236. Fruit didymous . GALIACEÆ.
Fruit not didymous CAPRIFOLIACEÆ.
237. Stem cylindrical, unbranched CYCADACEÆ.
Stem conical, branched . 238
238. Fruit solitary . . TAXACEÆ.
Fruit in cones . . PINACEÆ.
239. Ovary inferior . . . 240
Ovary superior . . 246
240. Flowers gynandrous ORCHIDACEÆ.
Flowers not gynandrous . 241
241. Anther 1 . . . 242
Anthers more than 1 . 243
242. Anther one-celled . MARANTACEÆ.
Anther two-celled . ZINGIBERACEÆ.
243. Veins of leaves diverging MUSACEÆ.
Veins of leaves straight . 244
Veins of leaves netted DIOSCOREACEÆ.
244. Stamens 3 . . IRIDACEÆ.
Stamens 6 . . . 245
Stamens more than 6 HYDROCHARACEÆ.
245. Sepals petaloid . AMARYLLIDACEÆ.
Sepals herbaceous BROMELIACEÆ.
246. Flowers glumaceous . . 247
Flowers regular . . 248
247. Sheaths of leaves slit GRAMINACEÆ.
Sheaths of leaves closed CYPERACEÆ.

248. Leaves netted . . SMILACEÆ.
Leaves straight-veined . 249
249. Carpels disunited . . 250
Carpels consolidated . . 259
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III.—THE MANNER OF STUDYING.

A. Take any common flowering plant, no matter what, and examine every part of its structure, making careful drawings of what you see, and securing preparations for examination at a future time.

There can be no doubt that the exact investigation of the structure, in all particulars, of the commonest plant, tends more to a correct knowledge of Botany than the superficial examination of all the plants in nature.

B. Such an investigation forms an exact standard of structure, to which all other cases may be *compared*. It also renders the observer acquainted with the names of organs, and of the adjective terms by which their modifications are denoted; because, in order to be sure that he observes correctly, it is also requisite that he should compare his own observations with the descriptions of experienced Botanists, in which such terms are employed.

C. As soon as the structure of one plant is ascertained, another should be taken, and the points in which it resembles or differs from the first subject noted down, and, if possible, also drawn. A continual repetition of this operation with fresh plants is what eventually leads to botanical knowledge.

D. In order to have the means of examining plants of various kinds, access to a garden is necessary, in aid of which the wild plants of a country must also be studied.

For it is only by the examination of a great variety of plants that just botanical views are acquired; and the necessary variety exists only in gardens.

E. At first, species should be little attended to, genera more, and natural orders very much. Because, in a vast science like Botany, containing perhaps 100,000 so-called species, distributed through about 9000 genera, collected under scarcely more than 300 natural orders, the mind becomes bewildered, unless the smallest groups are first investigated.

That is to say, 300 distinctions are more easily remembered than 9000. Nor can the power of generalizing be so readily acquired, as when the student habitually descends from generals to particulars. Moreover, the distinctions between what are called species are often trifling, and not unfrequently mere differences.

F. But for the purpose of study it is necessary to have a ready access to plants, and very often to those which have been examined over and over again. And this is impossible unless plants can be preserved artificially in a museum, because seasons, the various longevity of plants, no less than their prodigious numbers, render it impracticable to obtain them at all times, even in the largest garden.

G. Plants are best preserved by drying.

For this purpose they are carefully selected, so as to show their manner of growth and the various parts which may be proper to them. They are then placed between sheets of brown paper* carefully pressed, and shifted into fresh sheets as fast as the first become damp, until all their moisture is expelled. In this process they lose their colour, but retain their structure, and often the form of even delicate parts. When they are thin they dry quickly in a room; but when fleshy they are more difficult. This difficulty is much diminished by steeping

* Bentall's is the best.

them for an hour in a strong solution of corrosive sublimate before they are first pressed. The same process may be advantageously adopted with all plants in damp weather, or in damp climates, when it is difficult to prevent specimens from rotting; it will also destroy the disposition to throw off their leaves, which is uniformly shown by some plants, especially those with acerose leaves or jointed stems.

H. At the time of drying, a plant should be accompanied by a written label, stating its name, when and where it was gathered, and any other particulars which are not discoverable by an examination of it.

I. A collection of dried plants is called an *Herbarium;* and if carefully formed, perfectly kept, and correctly named, it is as invaluable to a student as it is indispensable to a Botanist.

The mode of keeping a Herbarium is this. Having formed a collection of species thoroughly dried, let them be washed with a large camel-hair pencil, dipped in spirits of wine, half saturated with corrosive sublimate, unless they had been dipped in a solution of it previous to drying. When parts are fleshy, or flowers are collected in heads, such parts should be soaked with the tincture, or they will be attacked and destroyed by the Anobium castaneum. This insect commits great ravages in herbaria, but he cannot prey upon parts that are poisoned.

Then provide—1. A glue pot, with hot carpenters' glue of the best quality, not so *stiff as it is used by carpenters;* 2. *A number of half-sheets of paper of the* foolscap form, but stouter and larger, neatly cut *all round;* 3. Some tough thin paper, smeared on one side with a solution of equal parts of gum arabic, powdered tragacanth, and soft sugar, dried and cut into slips varying in width from one-eighth to three-eighths of an inch; 4. A quantity of soft waste paper, somewhat larger than the half-sheets which are to form the herbarium.

In gluing down the specimens, it is convenient to proceed in the following manner:—Place on the table a few sheets of waste paper; on this lay one of the half-sheets; then carefully glue over one side of a specimen, apply it immediately to the paper, put over it a few more sheets of waste paper, and then gently press it down with a napkin; next take another half-sheet, glue down another specimen, again cover it with waste paper, and so proceed until a good heap is before you. Place that heap under gentle pressure, and then commence a fresh heap. In gluing down, observe the following additional rules: 1. Never put more than one species on the same half-sheet—take as many specimens of it as you please; 2. Always glue single specimens near one side of the half-sheet, and not in the middle, changing the side each time. By this means, one being on the right, the next on the left, a third near the top, and a fourth near the bottom, the whole will be flat when the waste paper is removed. But if this precaution is neglected, the middle will be much higher than the sides, which is very inconvenient.

Having glued down as many specimens as may be convenient, take them carefully out of the waste paper, and look them over to see that none of the parts are loose; if they are, fasten them down with the slips above mentioned, which are so adhesive that it is merely necessary to moisten and apply them. In all cases, too, strap down the main stem, unless it is covered with hairs, in which case straps are superfluous. The next operation is to write near the lower right hand corner of the half sheet the name of the plant, and in some convenient spot near the specimen itself the place in which it was gathered, or any other particulars connected with it. In small local herbaria, printed forms of tickets* are some-

* The following are specimens of such tickets. They are neat, and save trouble. The words in Italics are to be written in: those in Roman show the printed form.

Equisetum palustre. L.	*Betula nana* L.
Collected *on Barnes Common.*	Native of *Lapland.*
Communicated by *W. Jones.*	Received from *Professor Carling,* 1846.

times used, in which the name and all other particulars are included; such tickets should be pasted (not glued) upon the lower right-hand corner.

The next point is to arrange the half-sheets in genera. Sheets of stout brown paper, cut a little larger than the half-sheets, must be provided as covers. At the lower left-hand corner of each paste a slip of white paper, and write upon it the name of the genus, to which some add that of the natural order. Then put into each generic cover all the half-sheets belonging to it, and the operation is complete. The right-hand tickets or names on the half-sheets give the species, and the left-hand names on the whole sheets give the genera; and either can be rapidly referred to without the one interfering with the other.

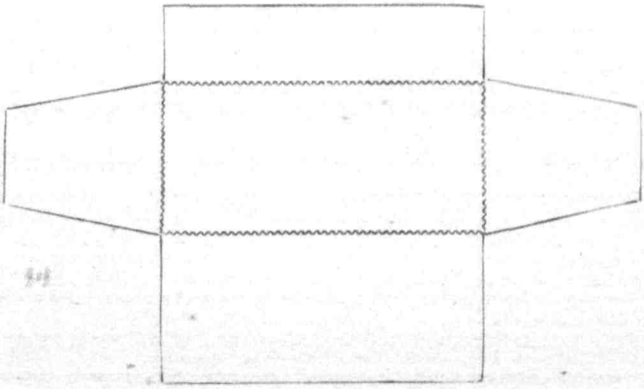
In foreign herbaria the specimens are seldom glued down, but are kept loose between whole sheets of paper, and tied in bundles. But such a plan is wholly unsuited to those persons with whom time is of value, exposes the specimens to be broken or mutilated, and causes a herbarium to occupy an inconveniently large space.

To receive the covers of genera, wooden cabinets are constructed, with shelves, on which the covers can be placed according to their natural orders.

For large fruits, and specimens which cannot be pressed flat, drawers must be provided, the method of managing which varies with the caprice of the possessor. The only directions of importance which require to be given are to have the drawers fit tight, so as to keep out dust, and to wash everything well with tincture of corrosive sublimate upon putting it in the cabinet.

K. When plants which have been preserved in the herbarium require to be examined, care must be taken not to break them by holding the half-sheets carelessly. The flowers and fruits can be restored to their original form by soaking for a few minutes in boiling water, and then absorbing the water by blotting-paper, if it is found inconvenient. Or if they are very hard, opaque, and tough, by adding a little caustic potash to the water.

In order to avoid the necessity of breaking off flowers, &c. from the specimens themselves, some Botanists take the precaution of attaching to the face of the half sheet a small paper case in which loose flowers can be preserved. Such cases, if cut to the following form, may be kept ready for use, of various sizes, and are very convenient.



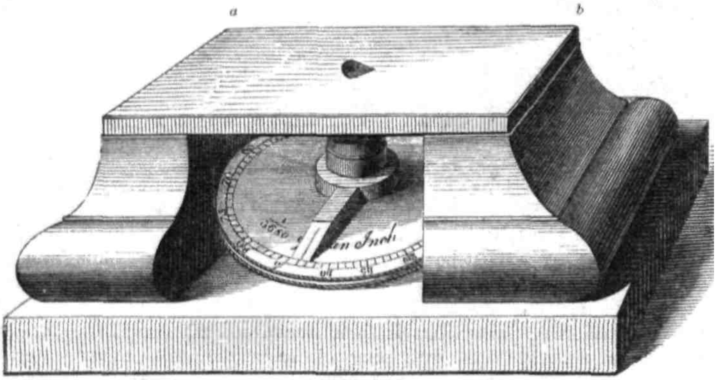
L. For the purpose of examining the external forms of plants, the student should also be provided with a good *simple* microscope and its stand, with three or four lenses, varying from an inch to ¼-inch focal distance.

It is indispensable that there should be a good stage on which to place the object for examination, and to rest the hands while dissecting, and that the pillar which carries the stage and lenses should be firmly secured.

M. For minute anatomy a simple microscope is of little use, and a good *achromatic* microscope is indispensable.

N. It is also useful to obtain, in addition to fine and very sharp knives and needles, a good cutting machine and razor, by which only can thin sections of plants be made satisfactorily.

The following cut represents such a machine :—*a b* is a solid brass plate screwed in two firm bearers. In the centre is a hole. That hole communicates with the head of a very fine threaded screw, which is moved upwards and downwards by the circular plate, whose circumference is divided off into degrees, each of which represents a turn of the screw equal to the $\frac{1}{3680}$ of an inch, and which will raise the head as little or as much as may be desired. The object to be cut is put



into the hole in the horizontal plate ; the screw is turned ; the object is raised, and a heavy razor, ground perfectly flat on one side, drawn rapidly across the object, cuts off a slice. In general, however, many slices must be made before a very satisfactory one is obtained. If an object is firm and solid it is pushed into the hole without preparation ; but if it is thin and unable to resist the pressure of the razor-edge sufficiently to receive a firm cut, it is strengthened by being rolled round a piece of cork or pith. It is in this way that perpendicular sections of leaves can alone be obtained. Where objects are so minute that this contrivance is inapplicable, then other means are employed according to the ingenuity of the operator. Very small seeds, starch grains, &c., are to be cut by imbedding numbers of them in a mass of gum dried to the texture of horn, and then repeatedly slicing them down.

O. When such slices have been obtained, they are to be examined by the aid of various re-agents as well as in their natural state.

The best re-agents, and the best way of applying them, are as yet but imperfectly understood. The following are, however, extremely useful rules to observe :—

1. Boiling in hot nitric acid, and transferring to cold water, will dissolve sclerogen without injury to tissue. NO_5 will also detect certain azotized matters, which it stains brown.
2. Boiling in caustic potash dissolves starch and renders bodies transparent.
3. Iodine renders all amylaceous matter violet, and all azotized matters brown. Good results are sometimes obtained by moistening tissue with very strong *tincture* of iodine, and afterwards soaking it in water.
4. If sections of tissue are soaked with tincture of iodine, washed in water, and then treated with sulphuric acid, the parts coloured yellow by iodine are heightened in colour, some cells will be stained blue or dissolved, and other effects produced according to the chemical nature of the tissues acted upon.
5. If cellulose is moistened with a solution of iodide of potassium containing free iodine, and, after removing the fluid not absorbed, a drop or two of sulphuric acid (4 parts rectified sulphuric acid and 1 part water) be then added, the cellulose will become blue, although previously brown. *Schacht.*
6. If cellulose, which is not affected by iodine, is first treated with weak sulphuric acid, and then with iodine, it readily takes a fine colour, and some-

times may be examined as to doubtful points; but the tissue is too much disorganized by this means to render such observations satisfactory unless confirmed by others of a different kind.

7. De Smedt and Boudet employ chloride of soda for distinguishing Guaiacum resin, which that agent turns green.
8. Cellular tissue may be sometimes separated from pleurenchyma by the action of concentrated sulphuric acid, which will dissolve out the former before the latter is much affected. The preparation is then to be washed in water, and afterwards immersed in hartshorn or solution of soda, in order to neutralize the remaining acid. *Kindt.*
9. Very transparent tissues are sometimes rendered visible by adding a drop of a solution of chlorine to a solution of ioduret of potassium. The tissue then becomes light blue, or yellowish, according to its nature.
10. Fritzche recommends two parts of concentrated sulphuric acid and three parts of water as an invaluable fluid in the examination of pollen: and in some cases he used the concentrated acid alone.
11. Alcohol dissolves out all resinous matters; and also expels air-bubbles. In observing the currents that proceed from the cytoblasts in hairs, Mohl directs the object to be dipped for a moment in alcohol, which is to be washed off again instantly. This removes a layer of air which adheres tenaciously to the surface of the hairs, and renders observation difficult.
12. Nothing however is, for general purposes of observation, so well adapted as water, except when parts are very opaque, and then oil or oil of turpentine are better. Nor ought the appearances produced by any of the re-agents above mentioned to be trusted in the absence of a careful comparison of them in the natural state.
13. Where very delicate membranes, too fine and transparent to be seen in water, are suspected to exist, they may be conveniently found by placing the slice between two plates of flat glass, and charring it over a spirit lamp. This simple process was first recommended by the Rev. Mr. Reade.
14. In order to use these contrivances, the student requires a spirit lamp, a platinum capsule, and a holder for it when it is to be held over flame.

P. When it is desirable to preserve such slices, or any other microscopical preparations, for future reference, they may be put up in glass slips, and kept in a cabinet.

The common way of keeping them is by surrounding them with Canada balsam between two plates of glass: but this method is only applicable to bodies having considerable opacity: all firm and delicate tissues disappear in the balsam. By far the best plan is that of Mr. Thwaites, whose preparations are unrivalled for their extraordinary beauty. This gentleman has favoured me with the following account of his process:—

"Rub up with a painter's muller some litharge (which may be coloured with lamp-black) with some thick japanner's gold-size, and put it as quickly as possible on the glass-slips with a camel-hair pencil; when it is hard, which will be in the course of a few days, rub the upper surface flat by means of the finest emery upon a slab of marble.

"When the object is to be mounted, wet the surface of the wall of the cell, as well as the border of the piece of thin glass, which will be applied to it, with a SMALL QUANTITY of gold size; then place the object in fluid in the cell, and place the thin glass over it, being careful to exclude bubbles of air—press it down gently and put two or three coats of gold-size round the margin so as to secure it from the admission of air. When the last coat of gold-size is tolerably hard, it may be advantageously covered with a coat or two of sealing-wax varnish.

"When a rather deep cell is required, this may be made with marine-glue, which must be dropped upon the glass as you would sealing-wax, and what is superfluous cut away with a knife.

"The fluid which I find to answer best for vegetable tissues I make in the following way:—To sixteen parts of distilled water add one part of rectified spirit, saturate with creosote, and filter through prepared chalk. The fluid thus prepared to be mixed with an equal portion of camphor water.

"It requires some little experience to know the proper proportions of litharge and gold-size for making the cells; but this will be discovered after a few trials.

The mixture soon hardens; therefore but little should be made at a time, and this be put on as expeditiously as possible."

Q. Experience shows that the foregoing points are among those which conduce most to the student's satisfactory progress; but neither they nor any others have real value in the absence of

METHOD, ZEAL, and PERSEVERANCE.

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PART II.

GLOSSARY OF TECHNICAL TERMS.

OF BOTANICAL TERMS.

It has been said by a modern writer that the language of Botanists is a pattern for imitation, because it shows how it is possible to invent technical terms with such a precise signification, that any imaginable variety of form, or other attribute, may be brought before the mind with as much accuracy, by mere words, as by a pictorial representation. Although there is some truth in this observation, it nevertheless requires considerable qualification, for if their technical terms do on the one hand communicate very considerable precision to the language of Botanists, it also introduces an amount of confusion, which should be anything rather than a subject of approbation.

The truth is this. The language of Botany was, when Linnæus left it, admirably suited to the demands then made upon it; and we may be permitted to add, that if the scientific dictatorship which he exercised, had been seized by a successor capable of maintaining his authority, it would, perhaps, have lost none of its excellence. But the wants of science increased with its progress; as new organs were distinguished, new substantives were wanted to express them; as new distinctions were pointed out, fresh adjectives swelled the Botanical Glossary; and as observers multiplied, each seems to have striven to exhibit a greater degree of precision than his predecessor, or contemporary. In addition to this, science struggled singly here and there, through the long wars, engendered by the ambition of the modern Attila; men worked alone; each nation or community studied for itself, thought for itself, and wrote for itself, and hence half a dozen names were proposed in different places to express the same idea. In short, from one cause or another, whether accident, ignorance, pedantry, over-fastidiousness, vanity or carelessness, the language of Botany is marvellously in want of reformation.

La Nomenclature de la Mycologie est un véritable Chaos, says Léveillé; an observation that might have been extended, with justice, to the whole of Cryptogamic Botany. In the division of Mycology, above forty different names are given to the spore-case; and what is worse, the very same name is given to essentially different organs, as is the case with the word Receptacle, which is applied indifferently to modifications of the hymenium, perithecium, spore-case, pores, &c. Above a dozen different names are given to the shields of Lichens, although there are no distinctions among them beyond such as well-devised adjectives would have abundantly expressed. These facts will be sufficiently shown in the following pages.

Writers of another class imagine that they acquire precision by substituting new words for old ones, as Count de Tristan with his *Hegemon*, *Aphrostase*, and *Cunix* ; Wallroth and Kutzing, in their unexampled innovations among Lichens and Algals. It is difficult to avoid speaking harshly of the Botanists who invariably propose special and strange names for every trifling modification of structure, in the vain hope of giving an impossible precision to the language employed in speaking of objects which have little precision in their nature. Add to the evils produced by these numerous writers, the phraseology of those who delight in words like *Stelechorrhiphysia* to express the monstrous curvature of a stem, in *Tergispermous* ! as a substitute for *Dorsiferous*, in *Tabacinus*, to indicate a colour like that of tobacco ! and it will be manifest that the task of preparing a Glossary of Botanical terms, is anything rather than a labour of love.

In fact a *complete* Glossary would involve an expenditure of time, which I should think very ill-spent. Nor is it necessary ; for the barbarisms to which allusion has thus been inevitably made, are not in general use. They have in many cases been born and died in the arms of their parents. Most Botanists repudiate them. What I have endeavoured to accomplish has been a brief but exact definition of the true meaning of all those words, which are or have been either in common use, or are likely to occur in works wherein they are not explained. It has also appeared unadvisable to introduce mere Latin and Greek words, which have no technical meaning, but are used in Botany as in common language ; to this class belong numberless words invented by Botanists for the names of species, such, for example, as *Chlorochrous*, which means green-skinned, *Hæmanthus*, or blood-red-flowered, and the like. Their number is infinite, and their meaning obvious ; and if such words were to be admitted, a Glossary would become a Dictionary.

There is also employed in this science a class of compound words which are only occasionally alluded to in the following Glossary. They are formed when terms having different meanings are combined in order to express some quality which is intermediate between those which the separate terms denote. Thus, *Ovate-lanceolate* signifies a form which is too long for ovate, two broad at the base for lanceolate, but between the two. *Viridi-luteus* again, is neither green nor yellow, but yellow with a green tinge, just as *Luteo-viridis* is green with a yellow tinge. These compound words have not however been wholly excluded; on the contrary, such as do not obviously explain themselves have been introduced.

In short, my object in this Glossary, as in all the remainder of this volume, has been to meet the wants of students, with the utmost economy of their money and time; and if they will only point out to me any omissions, or defects, or points that can be improved with reference to their purposes, I promise to give them the most careful attention in a future edition. Without such assistance, a good Glossary will never be prepared, because those who are most familiar with technicalities are the last to discover which they are.

A GLOSSARY

OF THE

PRINCIPAL ENGLISH, LATIN, AND LATINIZED TECHNICAL TERMS EMPLOYED IN BOTANY.*

N.B.—‡ indicates that a word is obsolete, or objectionable, or rarely used in the sense given. SB. refers to the cuts of School Botany, EB. to these Elements, and VK. to the Vegetable Kingdom.

A.—In Greek compounds—a negative, or the absence of something; as *a*petalous, having no petals, &c.

Abbreviations.—Signs to express particular attributes. The following are those commonly employed. ♂ = male; ♀ = female; ⚥ = hermaphrodite, or bisexual; ♂-⚥-♀ = polygamous; ♂ ♀ = diœcious; ♂-♀ = monœcious; ♂-⚥-♀ = triœcious; ① or ◯ = annual; ② or ♂ = biennial; ♃ = perennial; ♄ = a tree or shrub; 00 = an indefinite and considerable number of anything; ! placed after a person's name indicates that an authentic specimen from that person has been seen; * at the end of a citation denotes that a plant is fully described in the place referred to; *V.v.* = seen alive; *v.s.* = seen in a dried state; *v.c.* = seen cultivated; *v.sp.* = seen wild; ′ ″ ‴ When these signs are placed after a number, they express a foot, an inch, or a line respectively; thus, 5′ = 5 feet; 5″ = 5 inches; and 5‴ = 5 lines. Many others are also employed by various writers, but they are not worth repeating, as they are usually explained in the works wherein they appear.

Aberrant.—Something which differs from customary structure; a group of plants which stands intermediate, as it were, between two other groups; *e.g.*, Fumeworts are by some regarded as an *aberrant* group of Poppyworts.

Abnormal.—Contrary to usual structure. Stamens standing opposite to petals, and nowhere else, as in Rhamnads, are abnormal; it being usual for stamens to be alternate with petals if equal to them in number.

Aboriginal.—Original in the strictest sense; a term usually applied to the natives of a place, whether animals or plants.

Abortion.—The non-formation of a part which theoretically should be present; also an incomplete formation.

Abortive.—Imperfectly developed; as abortive stamens, which consist of a filament only; abortive petals, which are mere bristles.

Abrupt.—Suddenly terminating; as abruptly pinnated, when several pairs of leaflets are formed without any intermediate one at the end.

Absolute.—A term employed in opposition to relative; it may be regarded as equivalent to actual. The absolute direction of the embryo of a seed may be inverted, but it may be erect with reference to the seed-vessel. (*i.*)

I.

‡ *Acalicalis.*—Having no calyx. Also having no adhesion to the calyx, in which case it is the same as hypogynous.

‡ *Acanthon.*—See *Spine.*

‡ *Acanthophorus.*—Covered with spines, or prickly. Same as aculeatus (VK. 457).

Acaulis.—Having a very short stem. Theoretically, a plant without a stem cannot exist, unless it is a mere vesicle.

* Exclusive of proper or systematical names, for which the reader is referred to the Vegetable Kingdom and its Index.

Accessory.—Something additional; not usually present.

‡ *Accisus.*—When the end of anything has an acute sinus between two rounded angles. (*ii.*)

II.

Accrescens.—Growing larger after flowering. The calyx of Melanorhœa, which is small and green when in flower, becomes large and leafy when the fruit is ripe, and is an accrescent calyx.

Accrete.—Fastened to another body, and growing with it. *D. C.*

Accumbent.—Lying against anything, in distinction to *incumbent*, or lying upon (VK. 246, 17).

Acenium.—See *Achænium.*

‡ *Acephalus.*—Headless. A name used by Mirbel, for seed-vessels which are not terminated by a style, as in Labiates.

‡ *Acerellatus.*—Terminated by a very small, not very sharp point.

Acerosus.—Needle-shaped. The leaves of Heaths and Pine trees (SB. 221).

‡ *Acetabuleus.*—See *Acetabuliformis.*

Acetabulum.—The receptacle of certain Fungals.

Acetabuliformis.—Saucer-shaped.

Aceus.—A termination expressing a resemblance to the thing whose name it terminates; *foliaceus*=leaflike, of the texture of a leaf or *folium.*

Achænium.—Any small, brittle, seed-like fruit, such as Linnæus called a naked seed. Strictly, it should be confined to such fruits as those of the Rose or Strawberry, which are also one-seeded and superior.

‡ *Achroos.*—Colourless

Achlamydeous.—Having no floral envelopes whatever.

Acicula.—A bristle. The bristle-like abortive flower of a grass. (*iii.*)

III.

Aciculæ.—Tooth-like extensions which cover the fructiferous face of a distinct or membranous pileus among Fungals.

Acicular.—Shaped like a needle.

‡ *Aciculated.*—Marked by fine impressed lines, as if produced by the point of a needle.

Acies.—The edge of anything. The angles of certain stems.

Acinaciformis.—Scymetar-shaped. Curved, rounded towards the point; thick on the straighter side, thin on the convexity.

Acinus.—A bunch of fleshy fruits: as of currants or grapes. Now confined to the berries of such bunches.

Acotyledonous.—Having no cotyledons, as in Cuscuta (VK. 444, 5). But usually applied to what are now called spores, which were formerly thought to be embryos without cotyledons.

Acramphibrya.—Plants that grow both at the point and along the sides, as Endogens and Exogens.

Acrobrya.—Plants that grow at the point only, as all Acrogens having a distinct axis.

Acrogyratus.—Having an elastic ring at the point (VK. 60, 1).

‡ *Acrosarcum.*—A berry; a succulent fruit, containing many seeds, and not furnished with a hard lining or coating; a currant, a grape.

Acrospire.—The first leaves that appear when corn sprouts. (*iv.*)

IV.

Aculeatus.—Armed with aculei (SB. 80).

Aculeolatus.—Armed with small aculei.

Aculeus.—A prickle; conical elevation of the skin of a plant, becoming hard and sharp-pointed (SB. 80).

Acumen.—An acute terminal angle.

Acuminato-serratus.—When saw-toothings or serratures are much tapered to a point.

Acuminatus.—Extended into an acute terminal angle; this word is confined to considerable extension (EB. 118 b).

‡ *Acuminose.*—A flat extension into an acute terminal angle.

Acute.—Sharp-pointed.

Acute-angled.—Sharp-angled. A term generally applied to angular stems, and opposed to round or obtuse-angled.

‡ *Adducentia* (vasa).—The spiral threads of spiral vessels, which threads were thought by Hedwig to be sap-vessels.

‡ *Adductores.*—A name given by Hedwig to the Pistillidia.

Adelphia.—A fraternity—a collection of stamens. *Monadelphia*=one such collection, as in Malva (SB. 108, 1); *Diadelphia* = two such collections, as in some leguminous plants (EB. 169 p), and so on.

Aden.—In Greek compounds, signifies a gland or tubercle.

Adherent.—Strictly signifies sticking to anything, but it is more commonly employed in the sense of adnate. An *adherent ovary* = an ovary adnate to the tube of a calyx.

Adhesion.—See *Adherent.*

Adiscalis.—Not having a disk.

‡ *Adligans.*—Holding fast or binding down one thing to another; as the roots which bind the ivy to the object it touches.

‡ *Admotivus.*—When in germination the albumen holds fast to the cotyledon and remains attached to its sheath, such albumen was called Admotive by Richard.

‡ *Adminiculum.*—Any sort of organ supposed to be unnecessary to a plant, such as a stipule, a bract, a petiole, &c.

‡ *Adnascens.*—A small or secondary bulb—such as the Clove of Garlic. (*v.*)

V.

Adnatus.—Grown to anything by the whole surface; when an ovary is united to the side of a calyx it is adnate.

‡ *Adnexus.*—Same as *Adnatus.*

Adpressus.—Brought into close contact with anything without adhering.

Adpressoserratus.—When serratures are pressed close to the edge of the body to which they belong. (*vi.*)

VI.

Adscendens.—When a stem is at first horizontal, and afterwards curves gradually upwards into a vertical position (SB. 172).

‡ *Adscensus.*—An old name for the stem, or ascending axis.

‡ *Adsurgens.*—Same as *Adscendens.*

‡ *Adversus.*—Opposite to a place or thing. Usually expressed by oppositus.

Æqualis.—Not only signifies equality or similarity in size, but it is also used in the sense of uniformity; thus, umbella æqualis is an umbel of which the florets are all alike.

Æqualivenium.—When the veins are all of the same degree of distinctness.

‡ *Æquatus.*—Even; the reverse of uneven; applied to surface only.

Æquilaterus.—Equal-sided; applied to leaves, &c., when one side is of the same form and size as the other. The reverse of oblique.

‡ *Æquimagnus.*—Equal-sized.

Aërocystæ.—The air-cells of Algals.

Aërophytes.—Plants growing wholly in the air; such as epiphytal Orchids, many Lichens, Bromelworts, &c.

Æruginosus.—Verdigris-coloured.

Æstivalis.—Of or belonging to the summer.

Æstivatio.—The manner in which the parts of a flower are folded up before the flower expands (EB. 135).

Ætheos.—(In composition) Anomalous, unusual.

‡ *Æthereus.*—Native of the air; the same as aërial.

Affinity.—Is a term in systematic botany signifying, that one thing resembles another in the principal part of its structure, as Crowfoots and Poppyworts.

‡ *Agenus.*—Neuter; not being of either sex.

‡ *Adelome.*—Alburnum.

‡ *Aggedula.*—The sporangium of certain Urn-Mosses. The reproductive cases of Puccinia.

Agglomerate.—Heaped up; as the stamens in Anona and Magnolia, or the male flowers in a Pine tree.

Agglutinate.—Glued together; as grains of pollen in Asclepiads and Orchids.

Aggregate.—Several things collected together into one body; as the Achænia in the fruit of a Strawberry; the flowers of Cuscuta. (*vii.*)

VII.

‡ *Agynarius.*—Said of monstrous flowers in which the stamens are converted into leaves, and the pistils are missing.

‡ *Agynicus.*—Said of stamens which do not contract any adhesion with the ovary.

Aima.—In Greek compounds = Blood-coloured; properly, *hæma;* as hæmatosperma, a seed the colour of blood.

Akena, *Akenium.*—See *Achænium.*

Ala.—Formerly an axil, but not now employed in that sense. One of the lateral petals of a papilionaceous flower. A membranous expansion of any kind; as round the seed of a Bignoniad (VK. 455, 3); from the summit (VK. 277d) or the side of a seed-vessel (VK. 515, 2, SB. 110).

Alabastrus.—A flower-bud.

‡*Alaris.*—An obsolete term for axillaris.

Alatus.—Furnished with a membranous or thin wing or expansion. See *Ala.*

Alatepinnatus.—When the common petiole of a pinnated leaf has a winged margin. (*viii.*)

VIII.

Albedo.—Whiteness.

Albescens, *Albicans.*—Whitish; a colour fading or changing to white.

Albidus.—Dirty white.

Albinism.—A disease producing whiteness.

Albumen.—The matter that is interposed between the skin of a seed and the embryo, or the vitellus if there is one. Matter deposited in the cells of the nucleus during the growth of the seed.

Albuminous. — Furnished with albumen when perfectly ripe. A term exclusively applied to seeds.

Alburnum, ‡ *Alburna.*—The white wood of a tree; the younger wood, not choked up by sedimentary deposit, and therefore permeable to fluids.

Alburnitas.—A tendency to remain like alburnum. A disease of trees, when white rings of wood are interposed among heart-wood.

‡ *Alepidotus.*—Destitute of lepides or scurfs.

‡ *Alginus.*—Resembling a capillary Algal.

Alliaceus.—Having the smell of garlic.

‡ *Alimonia.*—An old word for the crude or ascending sap.

Alis.—A termination indicative of belonging to a thing; thus, *radicalis* means of, or belonging to, a *radix* or root.

‡ *Allagos.*—In Greek compounds = Alternate; thus *allagophyllous* is alternate-leaved.

Allagostemon.—When stamens are attached alternately to the petals and the *torus.*

Alternate.—Placed on opposite sides of an axis on a different line, as in alternate leaves (SB. 36). Placed between other bodies of the same or different whorls, as in an Umbellifer, where the stamens are alternate with, that is, between the petals (SB. 135).

Alternative.—A term of æstivation, when of the pieces of a flower, being in two rows, the inner is so covered by the outer that each exterior piece overlaps half two of the interior row (EB. 1351).

‡ *Alutaceus.*—Leathery; having the texture of leather; the same as coriaceous.

Alveola.—A socket.

Alveolæ.—The pores of some Fungals and the perithecium of others.

Alveolaris, *Alveolatus.*—Socketted, honeycombed; when a flat surface is excavated into very conspicuous cavities, as in the receptacles of many Composites. (*ix.*)

IX.

Algologia.—That part of Botany which treats of Algals.

‡ *Amalthea.*—A crowd of achænia, as in Ranunculus (VK. 298, bis. 2).

Amentum.—A catkin. A deciduous spike of unisexual apetalous flowers. (*x.*)

X.

Ambigenus.—When a part is of one nature on one side, and of another nature on the other side, as in the sepal of a Nymphæa,

which is green exteriorly and white interiorly.

‡ *Ambiguiflorus.*—Applied by Cassini to flowers of an indeterminate form.

Ambitus.—The outline of any flat body; the figure represented by its edges.

‡ *Ambrosiacus.*—A smell like that of musk.

‡ *Ambiparus.*—A term used to distinguish such buds as produce at the same time both flowers and leaves, as the Horse-chesnut.

Ammodytes.—Living in sandy places.

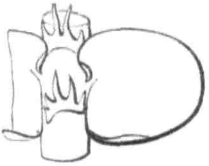
Amnios.—The fluid that is produced within the sac which receives the embryo-rudiment and engenders it.

Amorphous.—Having no definite form.

‡ *Amphanthium.*—The receptacle on which the flowers of a Fig or Dorstenia are seated.

Amphibryus.—Augmenting in diameter by additions over the whole surface or circumference.

Amphigastria.—The so-called stipules of Scale-mosses. (*xi.*)



XI.

Amphigenous.—Growing all round an object.

Amphisarca.—A polyspermous, multilocular, superior, indehiscent, fruit, woody on the outside, pulpy within.

‡ *Amphispermium.*—A seed-vessel which is of the same figure as the seed it contains.

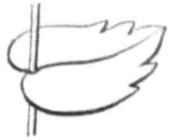
Amphitropal.—When an ovule is attached by its middle, so that the two ends are equidistant from the point of insertion. (*xii.*)

XII.

‡ *Amphora.*—The lower half of a pyxis; as in Henbane. (*xiii. a.*)

XIII.

Amplectans, *Amplexicaulis.*—Embracing; as when a leaf clasps a stem with its base. (*xiv.*)



XIV.

Amplexus.—Embracing. A term of vernation, when the two sides of one leaf overlap the two sides of the next leaf above it. (*xv.*)

XV.

‡ *Ampliatiflorus.*—A bad term applied to those Composites which have the florets of the ray enlarged, as in the Corncockle (Centaurea Cyanus).

Ampliatus.—Enlarged.

Ampulla.—The metamorphosed flask-like leaves found on certain aquatics such as Utricularia. (*xvi.*)

XVI.

Ampullæformis, *Ampullaceus.*—In the form of a bladder or short flask.

Amylaceous granules.—Grains of starch.

Amylideæ.—Cells in Algals, secreting starch.

Amylum.—Starch; that granular matter of plants which iodine stains violet or blue.

Amyloid.—A substance analogous to starch, but becoming yellow in water after having been coloured blue by iodine.

‡ *Anabices.*—The stem of any Thallogen or Acrogen, the reproductive part excepted.

‡ *Anacampyla.*—Lacerations of the skin, of a narrow form, such as occur on the cap of some Agarics.

Analogy.—Resembling a thing in form but not in function; or in function but not in form. Corresponding with a thing in many points but differing in more, or in points of more importance. *Ex.:* the flowers of Potentilla and Ranunculus are analogous.

‡ *Anandrarius.*—Having no stamens, but numerous floral envelopes and pistils in their place.

Anantherum.—Having no anther. Applied only to filaments.

‡ *Ananthus.*—Destitute of a flower.

Anasarca.—A dropsical or fleshy enlargement.

Anastomosis.—The angle formed by the union of veins, or of their branches.

Anatropal.—When an ovule is turned down upon itself, so that the foramen, or true apex, points to the base, and the chalaza is at the apex. (*xvii.*)

XVII.

Anceps.—Two-edged, as the stem of an Iris. (*xviii.*)

XVIII.

Ander.—In Greek compounds = the male sex; the stamen. *Monander* = having one stamen.

Andræceum.—The male system of a flower. The stamens taken collectively.

‡ *Androgynarius.*—When double flowers become so by a transformation of the stamens and pistil, without the floral envelope being changed.

‡ *Androgynicus.*—Of or belonging to an hermaphrodite flower.

‡ *Androgyniflorus.*—When all the flowers of the capitulum of a Composite are hermaphrodite.

Androgynus.—Applied to such kinds of inflorescence as consist of both male and female flowers.

‡ *Andropetalarius.*—When a flower becomes double in consequence of a multiplication of the corolla and a transformation of stamens into petals without the pistil being affected.

Androphorum.—The tube formed by a parcel of monadelphous filaments, as in Mallow.

Androus.—In Greek composition, refers to the stamens; thus, *monandrous* signifies having one stamen, &c.

Anfractuosus.—Twisted or rather sinuous, like the anther of a Cucurbit (SB. 144, 3).

Anfractus.—The turn of a spiral, or the curve of a sinuosity.

‡ *Angienchyma.*—Vascular tissue of any sort.

Angiocarpus.—A fruit covered by some envelope which disguises it, as the Spanish Chesnut, the Oak, the Filbert, all which have the fruit covered by the cupule. (VK. 200, 6.)

Angios.—In Greek compounds = a covering, usually an ovary; as *angiospermous* having seeds enclosed in an ovary.

Angiolum.—The spore-case of certain Fungals.

Angular.—Having projecting angles.

Angulato-hastatus.—Hastate, with the lower lobes connected with the stalk by a wedge-shaped process or part. (*xix.*)

XIX.

‡ *Angulinervius.*—When veins form an angle with the midrib of a leaf. (*xx.*)

XX.

‡ *Anisobrious.*—A name sometimes given to Endogens, upon the hypothesis that their force of development is greater on one side than the other.

‡ *Anisodynamous.*—Same as *Anisobrious.*

Anisomerus.—When the parts of a flower are unequal in number. The same as *Unsymmetrical.*

Anisos.—In Greek compounds = Unequal.

Anisostemonous.—When the number of stamens is different from that of the petals.

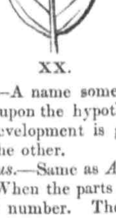
Annexus.—Adhering to the face of anything.

Annotinus.—A year old. *Rami annotini* are branches one year old.

Annual.—Flowering and fruiting in the same year in which it is raised from seed.

Annularis.—Having the form of a ring, as in certain embryos (SB. 106, 3).

Annulatus.—Surrounded by elevated rings or bands, or by scars in the form of rings (VK. 185, 183). (*xxi.*)



XXI.

Annuliformis.—Ringshaped; a name applied to such stigmas as that of many Dogbanes (VK. 406, 2).

Anomalous.—Irregular, unusual, contrary to rule.

‡ *Anomalæcious.*—See *Polygamous.*

Annulus.—A ring; as that which surrounds the spore-case of a fern (SB. 2), or the peristome of a moss; or the membrane remaining round the stipe of an agaric when the cap has expanded (SB. 250). In the latter case, it is a membranous or filamentous veil, inserted on the one hand round the stem, and on the other into the edge of the pileus, so as to cover the organs of reproduction.

‡ *Ansæ*.—The stalks of the segments or leaflets of a compound leaf.

‡ *Antemedius*.—Standing before the middle of some other body, as petals when they are opposite to sepals.

‡ *Anthela*.—The panicle of a rush.

Anther.—The case which contains the pollen of a plant.

‡ *Anthesmolysis*. — The metamorphosis of inflorescence.

Antheridia.—The so-called male organs of Urn-mosses and similar plants.

Anthesis.—The act of expansion in a flower.

‡ *Anthesmus*.—An inflorescence.

Anthocarpous.—Composed of flowers and fruit blended into a solid mass, as in the Pineapple.

‡ *Anthoclinium*.—The receptacle of the flowers in the capitulum of a Composite plant.

Anthocyane.—The blue colouring matter of plants.

Anthodium.—The head of flowers, or capitulum of Composites.

‡ *Anthodyum*.—The involucre of composites.

Antholysis.—The retrograde metamorphosis of a flower.

Anthophorum.—A short stalk or internode which sometimes intervenes between the calyx and petals, supporting the latter and the inner organs.

‡ *Anthophorus*.—Flowerbearing.

Anthos.—In Greek composition, a flower.

Anthosperm.—A little coloured concretion scattered in the tissue of certain Fucoids.

Anthotaxis.—The arrangement of flowers on an inflorescence.

Anthracinus.—Coal-black.

Anthoxanthine.—The yellow colouring matter of plants.

‡ *Anthurus*.—An inflorescence consisting of a cluster of flowers at the end of a long stalk.

Anticus.—Placed in front of a flower, the front being regarded as the part most remote from the axis. Thus, the lip of an Orchis is anticous.

‡ *Antidromal*.—When the direction of the spire of a lateral organ is the reverse of that on the central stem.

Antitropal.—The same as *Orthotropal*.

‡ *Antrum*.—An old name for the fruit now called a Pome.

‡ *Apagynus*.—A plant which fruits only once in its life.

‡ *Aperispermatus*.—When a seed has no albumen.

‡ *Apertio*.—The act of expansion in a flower.

Apertura.—The ostiolum of certain Fungals.

Apetalous.—Having no petals. Also extended to plants that have neither calyx nor corolla.

‡ *Apex*.—The ostiolum of certain Fungals.

‡ *Aphotistes*.—A plant growing in the absence of light; as a Truffle.

‡ *Aphrostase*.—Cellular tissue.

Apicalis.—At the point of anything.

‡ *Apices*.—The old name of the stamens.

‡ *Apicicircinnatus*.—Terminated in a circinate manner; as the leaf of Gloriosa superba. (*xxii*.)

XXII.

Apicilaris.—Inserted on, or originating from, the point or upper part of anything.

Apiculatus.—Terminating abruptly in a little point. (*xxiii*.)

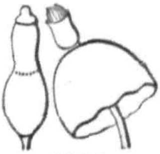
XXIII.

Apiculus.—A little point, not stiff.

Apocarpous.—Having the carpels, or at least their styles disunited.

‡ *Apodogynus*.—Said of a disk when it does not adhere to the base of the ovary.

Apophysis.—A thickened elongation, or enlargement of the base of the spore-case of an Urn-moss. (*xxiv*.)



XXIV.

Apostasis.—The monstrous disunion of parts naturally consolidated.

Apothecia.—The shields of Lichens; firm horny disks arising from the thallus, &c., containing spores. (*xxv*.)

XXV.

Appendages.—Leaves and all their modifications are appendages of the axis. Hairs, prickles, &c., are appendages of the part

which bears them. A name applied to processes of any kind.

‡ *Appendices*.—An old name for suckers; such as the offsets of a Pineapple.

Appendiculate.—Furnished with appendages; accessory organs, or expansions, of any sort.

‡ *Appendiculum*.—Any appendage or accessory part.

Apple.—A fleshy, inferior, plurilocular, few-seeded fruit.

Appositus.—Placed side by side.

Apricus.—Living in open sunny places.

Approximatus.—Brought close together.

Aquaticus.—Living in water.

Aquatilis.—Living under water.

Aquosus.—Watery; containing much water in the tissue.

Arachnoid.—Resembling cobweb in appearance; seeming to be covered with cobweb, in consequence of the entanglement of long white hairs.

‡ *Araneosus*.—Same as *Arachnoid*.

Arbor.—A tree; that is to say, a woody perennial plant, having a distinct bole or trunk, from which the main branches grow.

Arbusculus.—A tree of small dimensions.

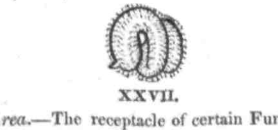
Arbustum.—A shrub; that is to say, a woody perennial plant, having no distinct bole, but only a collection of woody branches.

‡ *Arcesthide*.—A cone or strobilus, whose scales are fleshy, and become united; the same as *Galbulus*.

Archegonium.—The early condition of the spore-case, to which it stands in the same relation as the ovary to a ripe fruit.

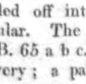
Archistreptes.—The principal spirals formed in the development of leaves.

Arcuato-areolatus.—Divided into spaces by curves. (*xxvi.*)



XXVI.

Arcuato-contortus. — Forming a depressed spiral, as in some kinds of legume. (*xxvii.*)



XXVII.

‡ *Area*.—The receptacle of certain Fungals.

Arcuatus.—Curved like a bow.

Arenarius.—Living in sandy places.

Areolæ.—The tessellated spaces in the thallus of some Lichens.

Areolate.—Divided off into distinct spaces, usually angular. The skin of a plant is areolate (EB. 65 a b c.)

Argenteus.—Silvery; a pale colour, resembling silver; an appearance often produced by air being present beneath the skin.

Argillosus.—Living in clayey places.

Argos.—In Greek compounds signifies pure white; the same as *Candidus*.

Argute-serratus.—Having fine sharp-pointed serratures. (*xxviii.*)

XXVIII.

Argyros.—In Greek compounds signifies silvery; of the colour of silver.

‡ *Arhizoblastus*.—An embryo which has no radicle.

Arhizus.—Having no root.

Aril, Arillus.—A body which rises up from the placenta, and encompasses the seed.

‡ *Arilliformis*.—Bag-shaped; resembling an aril.

Arillode.—A false aril; a coating of the seed proceeding from its own surface, and not from the placenta (*EB.* 214).

Arista.—The awn or beard of corn, or any such process.

Aristatus.—Furnished with an arista.

Armature, Arma.—Any kind of defence consisting of spines, prickles, &c.

‡ *Armeniaceus*.—Apricot-coloured.

Armeniacus.—A native of Armenia, according to De Candolle, but generally used to signify apricot-coloured.

Aroma.—The perfume of plants.

Aromaticus.—Having a spicy taste or smell.

Arrectus.—Pointing upwards.

Arrow-headed.—Shaped like a barbed arrow (EB. 118 b).

Articulatus.—Being jointed; that is, separating freely, by a clean scar from some other part. The reverse of continuous. (*xxix.*)

XXIX.

Articulus.—A joint; a place where spontaneous or easy separation takes place.

Artiphyllous.—A name given to such nodes as bear manifest buds.

Arvensis.—Living in open fields.

Ascelli.—The spores of certain Fungals.

Ascending.—Directed upwards; as the stem, which is the ascending axis. Rising upwards with a curve: as many stems. Simply rising upwards.

Ascens.—As a termination signifies having a tendency to a thing; as *cinerascens*, having a tendency to become ash-coloured.

Ascidia.—The asci of certain Fungals.

‡*Ascidiatus.*—Furnished with Ascidia.

Ascidium.—A pitcher; various modifications of leaves containing, or capable of holding fluid (EB. 112 c, h).

Asci.—Spore-cases consisting of a long or roundish cell containing spores.

Ascoma.—The Pileus, receptacle, pores, or lamellæ of certain Fungals.

Ascopora.—The spore-case of certain Fungals.

Asparagi.—Suckers; young shoots springing from beneath the ground, and usually covered with scales.

Asper.—Rough with hairs or points.

Aspergilliformis.—Brush-shaped, like the stigmas of grasses. (*xxx.*)

XXX.

Assurgens.—Same as *Ascending.*

‡ *Astathe.*—A substance supposed by Hartig to lie between the outer skin and lining of a cell.

‡ *Astichus.*—Not arranged in rows.

Astomous.—Not having an orifice.

Ater.—Pure black.

Athera.—In Greek compounds signifies an awn or stiff bristle, like the beard of barley.

‡ *Atractenchyma.*—Fusiform cellular tissue. See *Prosenchyma.*

Atramentarius.—Black as ink.

Atratus.—Blackened; when a portion of a part becomes gradually black; as the point of the glumes of Carex.

Atropal.—An ovule which never alters its original position (*xxxi.*); same as *Orthotropal.*

XXXI.

Atropurpureus.—Black purple; like the purple Scabious flowers.

Atroviridis, Atrovirens.—Deep green; like the leaves of a Pinaster tree.

Attenuatus.—Tapering gradually to a point.

Atus.—As a termination indicates the presence of an organ; thus, *corollatus* signifies having a corolla; *foliatus* having leaves.

‡ *Auleum, or Aulæum.*—An old name for the corolla.

Aurantium.—A succulent superior fruit with a tough rind, such as an orange.

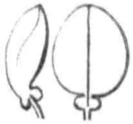
Aurantius, Aurantiacus.—Orange-coloured.

Auratus.—Metallic yellow; shot with gold.

Aureus.—Golden yellow, not metallic.

‡ *Auriculæ.*—The so-called stipules of Scale-mosses. See *Amphigastria.*

Auriculatus.—Having a pair of small round lobes or ears. (*xxxii.*)



XXXII.

‡ *Autocarpius.*—A term applied to fruits which are free from surrounding organs.

Autopsia.—The seeing a thing oneself. The knowledge of the external forms of plants. *Desvaux.*

Avenius.—Having no veins.

Awn.—The beard of corn, or any such slender process.

Awned.—Having an awn.

Axe-shaped.—Shaped like a ancient hatchet. (*xxxiii.*)

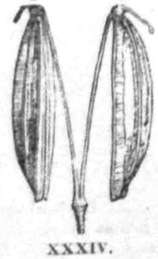
XXXIII.

Axis.—The stem including the root; or any centre round which leaves and other such organs are arranged.

Axis, accessory.—An axis of a second rank; secondary to some principal axis.

Axil, Axilla.—The angle formed between the axis and any organ that grows from it; the base of a lateral ascending organ, on the upper side.

Axile, Axial.—Of or belonging to the axis. In the accompanying figure of the fruit of an Umbellifer the carpophores are axile. (*xxxiv.*)



XXXIV.

Axillary.—Growing in the axil of anything. In the annexed figure a capitulum is axillary to a phyllodium. (*xxxv.*)

XXXV.

Axis, appendages of the.—All the leafy or thin expansions that grow upon a stem, such as leaves, and the parts of a flower.

Axis, ascending.—The stem.

Axis, descending.—The root.

Azureus.—Sky-blue.

Bacca.—A berry: that is to say, a succulent seed-vessel, filled with pulp, in which the seeds nestle, as in Solanum.

Bacca corticata.—A berry having a rind; as an Orange.

‡ *Bacca sicca.*—A fruit which is a berry when unripe, but becomes a dry body when ripe.

‡ *Bacca spuria.*—Any fleshy fruit, which is not a bacca; as the Juniper, Strawberry, Raspberry, &c.

Baccata semina.—Seeds with a pulpy skin.

Baccatus.—Having a pulpy texture; a term only applied to the parts of a flower or fruit.

‡ *Baccaularius.*—Such a fruit as that of the Mallow; viz. several one or two-seeded dry carpels cohering round an axis.

‡ *Baccausus.*—A union of several simple fleshy fruits in one flower, as in the Blackberry.

Bacilli.—The separable moving narrow plates, of which the genus Diatoma is composed.

‡ *Bacillus.*—The little bulbs found on the inflorescence of some plants.

Badius.—Chesnut-brown.

Balausta.—The fruit of the Pomegranate (EB. 212 b).

Banded.—Marked with cross-bars of colour.

Band-shaped.—Narrow and very long.

Barbatus.—Having long weak hairs, in one or more tufts. (*xxxvi.*)

XXXVI.

Barbs.—Hooked hairs (EB. 73, o, p).

‡ *Barbellæ.*—The hairs of the pappus of Composites, when they are short, stiff, and straight.

‡ *Barbellulæ.*—Small conical spine-like processes of the pappus of Composites, as in Aster.

‡ *Barbellulatus.*—Furnished with Barbellulæ.

Barbula.—The inner row of fringes or teeth in the peristome of such mosses as Tortula (VK. 45. 1).

Bark.—All the outer integuments of a plant beyond the wood, and formed of tissue parallel with it. The only true bark is that of Exogens. In Endogens *False Bark*, also called Cortical integument, stands in place of bark, from which it is known by the fibrous tissue of the wood passing into it obliquely.

Basal.—Growing at the base of anything, as ovules at the base of an axile placenta.

Basi bracteolatum.—A term applied chiefly to the involucre of a Composite, when it is surrounded at the base by a distinct order of bracts. (*xxxvii.*)

XXXVII.

Basidiospori.—The spores which stand upon the Basidia.

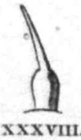
Basidia.—Little elevations found among Fungals, consisting of a single cell, having one or more points at its apex, each bearing a spore. (SB. 250, 2).

‡ *Basigynium.*—The stalk of an ovary above the stamens or petals (EB. 169 a).

Basifixus.—Attached by the base.

Basilaris.—Seated at the base of anything. See *Basal.*

‡ *Basilatus.*—Arising from a broad base, as certain hairs. (*xxxviii.*)



XXXVIII.

Basinervius.—When the ribs of a leaf all spring from its base. (*xxxix.*)

XXXIX.

‡ *Basis.*—The stipe of certain Fungals.

Basisolutus.—A term applied to leaves, which like those of Sedum, are extended downwards below their true origin. (*xl.*)

XL.

Beaked.—Ending in a long sharp terete, or angular point.

Bearded.—See *Barbatus.*

Bell-shaped.—Having the form of a bell (SB. 161).

Bellying.—When a round body is more prominent on one side, or at one point, than at another. (*xli.*)

XLI.

Berried.—See *Baccate.*

Berry.—See *Bacca.*

‡ *Besimen.*—A spore.

Bi.—(In compound words) twice.

Biarticulatus.—Two-jointed. (*xlii.*)

XLII.

Biacuminatus.—Having two diverging points. (*xlii.**)

XLII *

Bicarinatus.—Having two elevated ribs or keels on the under side, as in the paleæ of some grasses. (*xliii.*)

XLIII

Biauritus.—Having two little ears. See also *Auriculatus.*

Bicallosus.—Having two callosities, as the lip of many Orchids.

‡ *Biceps.*—A name given to that kind of keel in leguminous plants, where the legs or stalks are free. (*xliv.*)

XLIV.

Bicolor.—Two-coloured.

Biconjugatus.—When each of two secondary petioles bears a pair of leaflets. (*xlv.*)

XLV.

Biconjugato-pinnatus.—When each of two secondary petioles is pinnated. (*xlvi.*)

XLVI.

Bicornis, Bicornutus.—Having two horn-like processes. (*xlvii.*)

XLVII.

Bicruris.—Having two legs. (*xlviii.*)

XLVIII.

Bidentate.—Having two teeth.

Bidigitato-pinnatus.—Same as *Biconjugato-pinnatus.*

Biduus.—Lasting two days only.

Biennial.—Requiring two years to form its flowers and fruit, and then dying. Growing one year, flowering, fruiting, and dying the next.

Bifarius, Bifariam.—Arranged in two rows (SB. 240). This term is frequently applied to flowers, and to ovules.

Bifariam-imbricatus.—Imbricated in two rows. (*xlix.*)

XLIX.

Biferus.—Double bearing; producing flowers or fruit twice in the same season.

Bifidus.—Split half way into two parts. (*l.*)

L.

Biflorus.—Bearing two flowers on the same footstalk (SB. 123).

Bifoliolate.—Having two leaflets only to a leaf. (*li.*)

LI.

Bifolliculus.—A double follicle. (*lii.*)

LII.

Biforatus.—Having two pores or apertures. (*liii.*)

LIII.

Biforines.—Oblong cells, with an aperture at each end, through which raphides are expelled.

‡ *Bifrons.*—Growing on both surfaces of a leaf. Appearing equally like two different things.

Bifurcate.—Twice-forked; having two pairs of diverging horn-like arms.

Bigeminate.—Same as *Biconjugate.*

Bigeminus.—In two pairs; as the placentæ of many plants (VK. 447, 3).

Biglumis.—Consisting of two of the scales called, among grasses, glumes. (*liv.*)

LIV.

Bigeners.—Mule plants obtained by crossing species of different genera. This kind of hybridism has been said to be impossible; Kölreuter in particular adduced examples of failure in the attempt. But modern experimentalists incline to believe in the possibility of such a union.

‡ *Bihilatus.*—Having two scars, or projections, as in some pollen. (*lv.*)

LV.

Bijugus.—A pinnate leaf with two pairs of leaflets. (*lvi.*)

LVI.

Bilabiate.—Divided into two separate parts or lips, placed one over the other (EB. 152).

Bilamellatus.—Consisting of two plates, as many placentæ, stigmas, &c.

Bilobus.—Divided into two lobes. (*lvii.*)

LVII.

Bimestris.—Existing for two months only.

Bimus.—Lasting three years.

Binatim.—In pairs.

‡ *Binato-pinnatus.*—The same as *Bipinnate.*

‡ *Binatus.*—Same as *Bifoliolatè.*

‡ *Binervulatus.*—Having two vascular cords.

Bini.—Two together, twin.

‡ *Biniflorus.*—Bearing flowers in pairs.

Binodal.—Consisting of two nodes.

Binus.—In pairs.

Bipaleolatus.—Consisting of two small scales or paleæ, as in grasses. (*lviii.*)

LVIII.

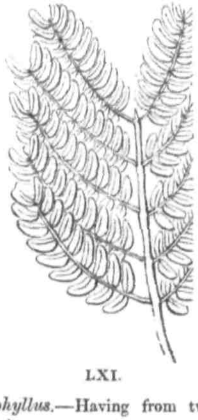
Bipartitus.—Divided nearly to the base into two parts. (*lix.*)

LIX.

Bipinnatiparted, Bipinnatifid.—When both the primary and secondary segments of a leaf are pinnatifid. (*lx.*)

LX.

Bipinnatisected, Bipinnate.—When the primary and secondary divisions of a leaf are pinnated. (*lxi.*)



LXI.

Bipentaphyllus.—Having from two to five leaflets.

Bipes.—Same as *Bicruris.*

Bipinnatipartito-laciniatus. — Being bipinnatifid with the divisions laciniated.

Biplicatus.—Having two folds or plaits.

‡ *Bipolymorious.*—Consisting of two or many parts.

Biporose.—Opening by two round holes. (*lxii.*)

LXII.

Biradiate.—Consisting of two or more rays as in certain umbels.

Birimose.—Opening by two slits, as most anthers (EB. 163).

Biseptatus.—Having two partitions.

Biserialis.—Arranged in two rows not on opposite sides of an axis; as on a flat surface. (*lxiii.*)

LXIII.

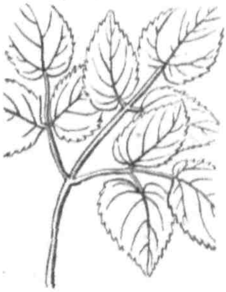
Biserrate.—When serratures are themselves serrate (SB. 30).

‡ *Bispathellulatus.*—Consisting of two spathellæ or glumes.

Bitten.—Terminated irregularly and abruptly; applied to leaves and roots. (*lxiv.*)

LXIV.

Biternate.—When the principal divisions of a leaf are three, each of which bears three leaflets. (*lxv.*)



LXV.

Bivittatus.—Having two vittæ.

Blade.—The lamina or expanded part of a leaf.

Bladdery.—Inflated like an animal bladder; as the fruit of the Bladder Senna or Colutea arborescens.

Blastema.—The axis of an embryo, comprehending the radicle and plumula, with the intervening portion. ‡ Also the thallus of a lichen.

Blastidia.—Secondary cells generated in the interior of another cell. (EB. 52). *Schleiden.*

‡ *Blastophorus.*—The vitellus.

‡ *Blastus.*—The plumule.

Blepharæ.—The teeth or fringes belonging to the peristome of an Urn-moss.

Bletting.—That kind of change which results in the formation of a brown colour, without putrefaction, as in the fruit of the Medlar.

Boat-shaped.—Having the figure of a boat in miniature, with its keel. (*lxvi.*)

LXVI.

Bombycinus.—Silky, feeling like silk; this term is not applied to hairiness of any sort.

Bossed.—Round and flat, with a prominent centre, as the Highland target; as the fruit of Paliurus Australis.

Botanos.—In Greek compounds, signifies a plant.

Bothrenchyma.—The pitted, or dotted, or so-called porous tissue of plants (EB. 23).

Botrys.—The term applied in Greek compounds to the Raceme. A bunch.

Botuliformis.—Sausage-shaped.

Brachialis.—An ell long; twenty-four inches long.

Brachiate.—When branches spread, at nearly right angles, alternately in opposite directions. (*lxvii.*)

LXVII.

Brachium.—An ell, or two feet.

Brachypodus.—Having a short foot or stalk.

Brachys.—In words of Greek origin, signifies short.

Bracteæ or *Bracts.*—The leaves placed immediately below a calyx, if they are at all altered from their usual form (SB. 183).

Bracteatus, ‡ *Bracteiferus.*—Having bracts.

‡ *Bracteanus.*—Formed of bracts.

Branches.—The divisions of a stem, or any other part of the axis of growth.

Breathing-pores.—See *Stomates.*

Brevi-ramosus.—Short-branched.

Brick-colour.—A dull red, like that of a red brick.

Bracteolæ or *Bractlets.*—Bracts of a second order, usually smaller and more changed than the true bracts, also small bracts. (*lxviii. a*)

LXVIII.

Bristle-pointed.—Terminating in a stiff short hair. (*lxix.*)

LXIX.

Bristles.—Stiff sharp hairs. (*lxx.*)

LXX.

Bristly.—Covered with stiff sharp hairs.

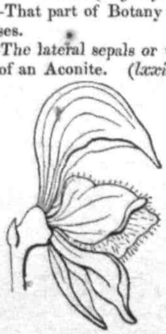
Brown red.—Dull red, with a slight mixture of brown.

Brunneus.—Deep brown; not much different from chesnut-brown.

Brush-shaped.—See *Aspergilliform.*

Bryology.—That part of Botany which treats of mosses.

‡ *Buccæ.*—The lateral sepals or wings of the flower of an Aconite. (*lxxi.*)



LXXI.

Buckler-shaped.—Having the form of a small round buckler. (*lxxii.*)

LXXII.

Bud.—The young folded-up branch or flower.

Bulb.—A leaf-bud, the scales of which are fleshy, and which propagates an individual (SB. 9).

Bulb, naked.—A bulb whose scales are loose and almost separate, as in the Crown Imperial. (*lxxiii.*)

LXXIII.

Bulb, solid.—A corm, which see.

Bulb, tunicated.—A bulb whose outer scales are thin and membranous.

Bulbiceps.—A stem, bulbous at the base (VK. 295, 1).

Bulbillus.—An axillary bulb with fleshy scales, which falls off its parent spontaneously, and propagates it.

‡ *Bulbodium.*—The solid bulb of old botanists. A corm, which see.

Bulbosus.—Having the structure of a bulb; having bulbs.

Bulbosi pili.—Hairs that proceed from a swollen base. (*lxxiv.*)

LXXIV.

Bulbotuber.—A corm, which see.

Bulbus squamosus.—A naked bulb, which see.

Bullatus.—Blistered; puckered; when the parenchyma of a leaf is larger than the area in which it is formed.

‡ *Bursa.*—The antheridium of a Chara.

Bursicula, (adj. *Bursiculatus.*)—A small purse. The pouch-like expansion of the stigma, into which the caudicle of some Orchids is inserted. (*lxxv.*)

LXXV.

Butterfly-shaped.—See *Papilionaceous.*

Byssus.—The stipe of certain Fungals.

Byssaceous.—Composed of fine entangled threads.

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‡ *Cachrys.*—The cone of a Pine Tree.

‡ *Cacumen.*—The axis of anything. The line, real or imaginary, that passes from the base to the summit of anything.

Caducous.—Dropping off.

Cæruleus.—Blue; a pale indigo colour.

Cæsius.—Lavender colour.

Cæspitose.—Growing in tufts or patches.

‡ *Cætonium.*—The glumes of grasses.

‡ *Calamus.*—A fistular stem without an articulation.

Calathiformis.—Cup-shaped; or almost hemispherical.

Calathida, Calathis, Calathium.—The head of flowers borne by Composites (SB. 157).

‡ *Calathidiflorus.*—Bearing a calathid or capitulum.

‡ *Calathiphorum.*—The stalk of the calathid.

Calcar, (adj. *Calcaratus*).—A spur; a hollow process of some part of a flower (SB. 224, 2.)

Calcareus.—Dead-white, like chalk. Also growing in chalky places; or having the substance of chalk.

Calceolate.—Having the form of a slipper (EB. 151, b), or round-toed shoe.

Calcariformis.—Shaped like a calcar or spur.

Calceus.—Dead-white, like chalk.

‡ *Calicalis.*—Of or belonging to the calyx.

Calicatus.—Furnished with a calyx.

Calycinus.—Of or belonging to a calyx; having the texture of a calyx.

‡ *Calicinaris.*—When a flower becomes double by an increase in the number of lobes of the calyx or sepals.

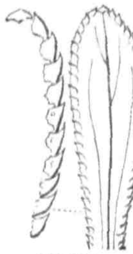
‡ *Calicinianus.*—Originating in a calyx.

‡ *Calicularis.*—A term of æstivation, when the outer bracts of an involucre are much shorter than the inner.

Calyculus.—A partial involucre, containing but one, or perhaps two flowers. Also the external bracts of a capitulum, when they form a distinct ring or rings.—See *Basi-bracteolatum.*

Callus, (adj. *Callosus*).—A hardened part; anything which has acquired unusual hardness and toughness. Also used in the sense of verruca. ‡ Also the hymenium of certain Fungals.

Calloso-serratus.—When serratures are callosities. (*lxxvi.*)



LXXVI.

‡ *Calopodium.*—The spathe of an Arad.

‡ *Calpa.*—The spore-case of certain Urn-mosses.

Calvus.—Quite naked. Bald. Having no hairs, or other such processes.

‡ *Calybio*, *Calybium.*—A hard, one-celled, inferior, dry fruit, seated in a cupule; as an acorn, or a Hazel-nut.

Calyciflorus.—Growing on the calyx.

Calycinalis.—Of or belonging to the calyx.

Calycinus.—Of or belonging to a calyx. Also a calyx of unusual size.

Calycoideus.—Resembling a calyx.

‡ *Calycostemon.*—A stamen that grows on a calyx.

Calyptra, (adj. *Calyptrate*).—The hood of an Urn-moss (SB. 248).

Calyptriformis.—Shaped like a calyptra, or extinguisher; as the calyx of Eucalyptus.

Calyx.—The most external of the floral envelopes; it is called *adhærens*, or *superior*, when it is not separable from the ovary; *liberus*, or *inferior*, when it is separate from that part; *calyculate*, when it is surrounded at the base by bracts in a ring. (*lxxvii.*) ‡ Also the

LXXVII.

receptacle of certain Fungals.

‡ *Calyx communis.*—The old name of the involucre of Composites, &c.

‡ *Camara.*—A carpel.

‡ *Camarius.*—Resembling a simple carpel; as the fleshy berry-like fruit of Actæa.

Cambium.—The viscid fluid which appears between the bark and wood of Exogens, when the new wood is forming. Also the mucus of vegetation out of which all new organs are produced.

‡ *Camerula.*—A small cell in the interior of a plant.

Campanulate, *Campanaceus*, *Campaniformis.*—Shaped like a bell (SB. 161).

Campestris.—Growing in open fields or plains.

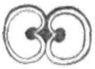
Campylotropal.—An ovule, one of whose sides grows much faster than the other, so that while the chalaza remains at the hilum, the foramen is brought nearly into contact with it. (*lxxvii.*)

LXXVIII.

Camptotropal.—An orthotropal ovule, curved downwards like a horse-shoe, with the sides adherent. (*lxxix.*)

LXXIX.

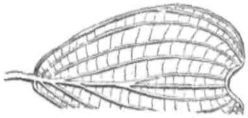
Campylospermous.—When a seed or seed-like fruit is so rolled up as to have a furrow in the longer diameter of one side. (*lxxx.*)



LXXX.

Canaliculatus.—Channelled, like the petioles of many leaves.

Cancellate.—Composed of veins only; all the parenchyma or intervening web being absent. (*lxxxi.*)



LXXXI.

Candidus.—Pure white, but not so white as snow.

Canescens.—Greyish-white. A term applied to hairy surfaces.

Canus.—Grey-white. A term applied to hairy surfaces.

Cap.—The convex part of an Agaric, or similar Fungal (SB. 250, 1).

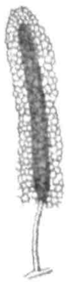
Capillaceus, *Capillaris.*—Having the form of a thread (SB. 84, the lower part).

‡ *Capillamentum.*—The filament.

‡ *Capillatæ radices.*—Roots covered with hairs, such as those which are first produced after germination.

Capillus, (adj. *Capillaris*).—The breadth of a hair; the twelfth part of a line.

Capillitium.—Entangled filamentary matter in Fungals, bearing sporidia. (*lxxxii.*)



LXXXII.

Capitatus.—Pin-headed, as the stigma of a Primrose, or certain hairs (EB. 73 a, l.). Also growing in heads, or terminal close clusters, as the flowers of Composites, &c.

‡ *Capitiformis.*—Shaped like a head.

Capitulum.—A close head of sessile flowers. Also a term vaguely applied among Fungals to the receptacle, pileus, or peridium.

‡ *Capreolus.*—A tendril.

Caprificatio.—A fertilisation of flowers by the aid of insects; as that of the garden Fig by a small fly.

‡ *Capsella.*—The same as Achænium.

Capsule, (adj. *Capsular*).—Any dry dehiscent seed-vessel. A spurious capsule ‡ is any dry seed-vessel that is dehiscent. ‡ Also employed among Fungals, to denote certain kinds of perithecium, or receptacle.

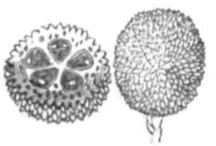
Capsuliferus.—Capsule-bearing.

Caput.—The peridium of certain Fungals.

‡ *Caput florum.*—Same as *Capitulum*.

‡ *Caput radicis.*—The crown of a root. The very short stem, or rather bud, which terminates the roots of herbaceous plants (EB. 75, c).

‡ *Carcerulus*, (adj. *Carcerular*).—An indehiscent, many-celled, superior fruit, such as that of the Linden. (*lxxxiii.*) ‡ Also



LXXXIII.

employed among Fungals to denote their spore-case.

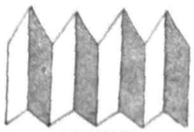
Carcinoma.—A disease in trees when the bark separates, an acrid sap exuding and ulcerating the surrounding parts.

Carcithium.—The mycelium of certain Fungals.

‡ *Carcytes.*—See *Mycelium*.

Carina, (adj. *Carinatus*).—A keel. The two anterior petals of a papilionaceous flower, the three anterior in a Milkwort, or any such. Also the thin sharp back of certain parts; as that of a glume of Phalaris, &c.

Carinato-plicatus.—So plaited that each fold is like a keel, as in the peristome of some Urn-mosses. (*lxxxiv.*)



LXXXIV.

Cariopsis.—A one-celled, one-seeded, superior fruit, whose perica[illegible] membranous and united to the seed; as corn.

Cariosus.—Decayed; rotted off.

Carmine.—The purest red, without admixture.

Carneus.—Flesh-colour; the pale red of Roses.

Carnositas.—Fleshiness.

Carnosus.—Fleshy; of the consistence of flesh.

Caro.—The fleshy part of fruit. The flesh or tissue of which Fungals consist.

‡ *Carpadelium.*—An inferior indehiscent two or more celled fruit with solitary seeds, and carpels which, when ripe, separate from a common axis. as in Umbellifers.

Carpel, (adj. *Carpellaris*).—One of the rolled up leaves of which the pistil is composed, whether they are combined or distinct.

Carpicus.—Of or belonging to a seed-vessel.

Carpidium.—The same as carpel.

‡ *Carpium.*—A carpel.

Carpoclonium.—A free case or receptacle of spores found in certain Algals. (*lxxxv.*)

LXXXV.

Carpology.—That part of Botany which treats of the structure of fruits and seeds.

‡ *Carpoma.*—A collection of Spermangia.

‡ *Carpomorpha.*—Those parts in cryptogamic plants which resemble true fruits without being such. The spores of Lichens.

Carpon.— In Greek compounds = the fruit.

‡ *Carpophorum.*—The stalk of the pistil above or beyond the stamens.

‡ *Carpophyllum.*—The same as carpel.

‡ *Carpopodium.*—A fruit-stalk.

Carpostomium.—The opening into the spore-case of Algals.

Cartilaginous.—Hard and tough, like the skin of an Apple-seed.

‡ *Chortonomia.*—The art of making an herbarium.

‡ *Chromatidium.*—The colouring matter of plants.

Chromism.—A præternatural colouring of plants, as that of leaves when they become red, &c.

Chromule.—The fluid colouring matter of vegetation.

Chrysaloideus.—Rolled up and folded up at the same time.

Chrysanthus.—Yellow flowered.

Chryso. — In Greek compounds = golden yellow.

Chrysochrous.—Having a yellow skin.

‡ *Chymifera vasa.*—An imaginary sap-thread which Hedwig fancied to be rolled round a tube to form a spiral vessel.

Cicatricule.—The scar formed by the separation of a leaf from its stem.

Cicatrisatus, ‡ *Cicatricosus.*—Marked with scars.

Cicatrix.—Any kind of scar formed by the separation of one part from another.

Ciliæ, (adj. *ciliated*).—Marginal hairs forming a fringe. (*xciii.*)

XCIII.

Ciliato-dentatus.—When the teeth of anything are finely serrated as if fringed. (*xciv.*)

XCIV.

Cimicinus.—Smelling of bugs, as Coriander.

Cinctus.—A term applied to albumen when surrounded by an annular embryo (SB. 106, 3).

Cinenchyma.—That kind of tissue in which latex, or the proper juice of plants, is conveyed from place to place (EB. 46.)

Cineraceus.—Ash-greyish.

Ciliato-serratus.—When the serratures of anything end in a hair. (*xcv.*)

XCV.

Cinereus.—Ash-grey; a mixture of white and black.

Cinnabar, *Cinnabarinus.*—Scarlet touched with orange.

Cinnamomeus.—The colour of Cinnamon.

Circa.—In Latin compounds, round about.

Circinalis, *Circinate.*—Bent like the head of a crosier. (*xcvi.*)

XCVI.

Circumpositio.—A layer; that is to say, a branch laid into the ground in order that it may strike root.

Circumscissile, *Circumscissus.*—Cut circularly round the sides (SB. 74).

Circumscriptio.—The outline of anything.

‡ *Circumsepientia folia.*—Leaves which rise up like a funnel and surround the stem as if to protect the young shoots, as in the Mallow of Peru. (*Decandolle.*)

Cirrhiferus.—Bearing a tendril.

Cirrhiformis.—Shaped like a tendril.

Cirrhositas.—The production of tendrils.

Cirrhus, (adj. *Cirrhose.*)—A tendril. A slender twisting organ by which a plant climbs. (*xcvii.*)

XCVII.

Cistoma.—A membranous sac which penetrates stomates, and reaches the bottom of the subjacent chamber (EB. 70).

Cistophorum.—The stipe of certain Fungals.

Cistella, Cistula.—A cell-like shield found in the genus Sphærophoron. (*xcviii.*)

XCVIII.

Citreus, Citrinus.—Lemon-coloured.

‡ *Cladenchyma.*—Branched parenchyma (EB. 10, 55).

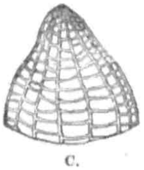
Clados.—In Greek compounds = a branch.

‡ *Cladostroma.*—A receptacle, or growing point covered with carpels, each of which has a free placenta (*xcix.*)

XCIX.

Clathrus.—A lattice; a membrane pierced with holes and forming a kind of grate.

Clathratus.—Latticed; pierced with rectangular apertures. (*c.*)



C.

‡ *Clausilus.*—A name given by Richard to his macropodal embryo, when its radicle is united by the edges and entirely incloses all the rest.

Clavatus, claviformis.—Gradually thickening upwards, from a very taper base; as the appendages of the flower of Schwenckia. (*ci.*)

CI.

‡ *Clavicula.*—A tendril.

Clavula.—The receptacle, or spore-case, of certain Fungals.

Clavus.—The disease which produces ergot in grasses; so called because it causes the young grain to grow into the form of a nail or club.

Claw.—The long narrow base of the petals of some flowers; the analogue of the petiole. (*cii.*)

CII.

Clestines.—Large cells of parenchyma, in which raphides are often deposited (EB. 64).

Clinandrium.—The bed of the anther, of Orchids; an excavation of the top of the column, in or on which the anther lies. (*ciii.*)

CIII.

Clinanthium.—A flat or broad space, on which flowers are packed closely; the receptacle of Composites; a shortened widened axis (VK. 181).

Clinium.—In Greek compounds, = receptacle. Also an accessary part of certain Fungals, consisting of very small, long, simple, or branched cells, bearing a spore at their end (*Leveillé.*)

‡ *Clonarium.*—The ripe spiral-coated nucule of a Chara.

Clouded.—When colours are unequally blended together.

Cloves.—The small bulbs formed within the mother-bulb of certain plants; such as Garlic.

Club-shaped.—See *Clavatus.*

Clustered.—Collected in parcels, each of which has a roundish figure; as the flowers of Cuscuta (VK. 424).

Clypeatus.—Having the form of an ancient buckler; the same as scutate.

Coacervatus.—See *Clustered.*

‡ *Coadnatus, Coadunatus, Coadnitus, Coalitus.*—See *Connatus.*

Coalitio.—The growing of one thing to another; as that of petals, which causes a monopetalous corolla, &c.

Coarctatus.—Contracted; drawn close together.

‡ *Coarcture.*—The neck of a plant.—See *Collum.*

Cobwebbed.—Covered with loose, white, entangled, thin hairs, resembling the web of a spider.

Coccidium.—See *Cystocarp.*

Coccineus.—Pure carmine colour, slightly tinged with yellow.

Coccodes.—Resembling pills; consisting of spheroidal granulations.

Coccus.—A shell; a carpel, which separates with elasticity from an axis common to itself and others (VK. 194, 326, 3).

Cochlear.—A term used in describing æstivation; when one piece, being larger than the others, and hollowed like a helmet or bowl, covers all the others; as in Aconitum. (*civ.*)

CIV.

Cochleariformis.—Spoon-shaped.

Cochleate.—Twisted in a short spire, so as to resemble the convolutions of a snail-shell; as the pod of Medicago cochleata, the seed of Salicornia (SB. 121, 7).

‡ *Cochlidiospermata.*—Seeds which are convex on one side, and concave on the other, owing to unequal growth, or anomalous structure. (*cv.*)

CV.

Cœlospermus.—Hollow-seeded; when the seed, or seed-like fruit, is hemispherical, and excavated on the flat side; as in Coriander.

Cœnanthium.—The receptacle of flowers in the inflorescence called a Capitulum; same as *Clinanthium.*

‡ *Cœnobio.*—Same as *Carcerulus.*

Cœruleus.—Blue; a pale indigo colour.

Cœsius.—Lavender colour.

Cohesion.—The union or superficial incorporation of one organ with another.

‡ *Coinopodus*, or *Cœnopodus.*—Terminating downwards in a cone, as the embryo of most plants.

Colenchyma.—See *Collenchyma.*

‡ *Coleophyllum*, or *Coleoptilum.*—The first leaf which follows the cotyledon in Endogens, and ensheaths the succeeding leaves.

Coleorhiza, (adj. *Coleorhizatus.*)—The sheath formed at the base of an Endogenous embryo, when it is pierced by the true radicle.

Colesula.—The small membranous bag which contains the spore-case of Liverworts.

Collar.—The ring upon the stipe of an Agaric; also see *Collum.*

‡ *Collare.*—The ligula, or transverse membrane that stands in grasses at the junction of the blade and sheath of the leaf. (*cvi*).

CVI.

Collateral.—Standing side by side.

Collectors.—The hairs found on the style of such plants as the Campanula, which collect or brush out the pollen from the anthers.

Collenchyma.—The cellular matter in which the pollen is generated; usually absorbed, but remaining and assuming a definite form in some plants, as in Orchids, or delicate threads, as in Œnothera (VK. 121, 5).

‡ *Colliculosus.*—Covered by little round elevations or hillocks.

‡ *Colliferus.*—Bearing a collar, as the stipe of an Agaric.

Collinus.—Growing on low hills.

Collum.—The point of junction between the radicle and plumula; the point of divergence of the ascending and descending axes; that is to say, of the root and stem. Also the lengthened orifice of the ostiolum of a Lichen; *Colliforme* is sometimes used for an ostiolum, whose orifice is lengthened into a neck.

Colour, (adj. *Coloured*, *Coloratus*). — Any colour except green; in technical Botany white is regarded as a colour, and green is not.

‡ *Colpenchyma.* — Sinuous cellular tissue (EB. 656).

‡ *Colum.*—The placenta.

Columella.—A little column; the firm centre of the spore-case of an Urn-moss, from which the spores separate. (*cvii.*) The

CVII.

long axis round which the parts of a fruit are united, namely, the ripened growing point; a slender axis, over which the spore-cases of such Ferns as Trichomanes are arranged. (VK. 58).

Columna.—The combination of stamens and styles into a solid central body; as in Orchids (VK. 119, 1, 2, 3, 4).

Columnaris.—Having the form of a column, as the stamens of a Mallow-wort (SB. 108. 1).

Coma, (adj. *Comose*).—The hairs at the end of some seeds; the empty leaves or bracts at the end of the spike of such flowers as the Pine-apple.

‡ *Combinate-venosus.*—When the lateral veins of a leaf unite before they reach the margin.

Comb-shaped.—See *Pectinatus.*

Commissure.—The face by which two carpels cohere, as in Umbellifers (SB. 140, B).

‡ *Communis calyx.*—An involucre.

Communis petiolus.—The first and principal leaf-stalk in compound leaves; the secondary petioles are called partial.

‡ *Compaginatus.*—Packed closely one over another.

Complexus.—Tissue; *C. cellulosus,* cellular tissue; *C. membranaceus,* the thin membrane, which is the foundation of all tissue—elementary membrane; *C. tubularis* is tubular tissue, or woody fibre; *C. utricularis,* angular cellular tissue; *C. vascularis,* spiral vessels, properly so called: it is, however, often extended to all sorts of tubes with markings on the side, and so loses precision, and with it all value as a scientific term.

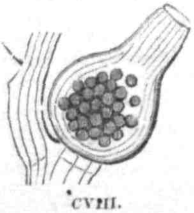
Complicatus.—Folded up upon itself.

Composition.—The arrangement of organs, or their order of development, or their manner of branching, &c.

Compound, Compositus.—When formed of several parts united in one common whole; as pinnated leaves, all kinds of inflorescence beyond that of the solitary flower.

Compressed.—Flattened lengthwise; as the pod of a Pea.

Conceptaculum.—A hollow case containing gongyli in Algals. (*cviii.*) Also a special



CVIII.

organ, developed in some Fungals on the surface, or in the interior of a receptacle, and containing the organs of reproduction as well as their accessories; it differs from a spore-case in the latter being itself one of the accessories, and only containing spores.—*Leveillé.*

‡ *Conchiformis.*—Shaped like one valve of a common bivalve shell.

Concolor.—Of the same colour as some other thing compared with it.

Conduplicantia folia.—Doubling up; as when the leaflets of a compound leaf rise up and apply themselves to each other's surfaces.

Conduplicate, Conduplication.—A term of æstivation; when the sides of an organ are applied to each other by their faces. (*cix.*)

CIX.

‡ *Condylium.*—The antheridium of a Chara.

Cone.—The strobilus or conical arrangement of scales in the fruit of a Pine or Fir-tree.

‡ *Conenchyma.*—The conical cells which constitute hairs (EB. 5).

Confertus.—When parts are pressed closely round about each other; packed close.

Conferruminate.—Glued together.

Confluent.—The fastening together of homogeneous parts.—*Decandolle.* Gradually uniting organically.

Conformis.—Of the same form as some other thing.

‡ *Congenital.*—Grown to anything. The same as *Connate.*

Congestus.—Crowded very closely.

Conglobatus.—Collected into a ball, as the florets of Echinops.

Conglomeratus.—See *Clustered.*

Conglutinatus.—Glued together, not organically united.

Conical.—Having the figure of a true cone, as the prickles of some Roses, the root of Carrot.

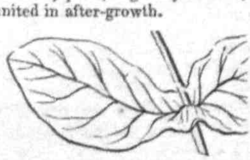
‡ *Conidium.*—The gonidium of a Lichen.

‡ *Coniothecæ.*—The cells of an anther.

Coniocysta.—Closed spore-cases resembling tubercles, and containing a mass of spores.

Conjugato-palmatus.—When a leaf divides into two arms, each of which is palmate.—*Decandolle.*

Connate.—When the bases of two opposite leaves are united together. (*cx.*) Also when any parts, originally distinct, become united in after-growth.



CX.

Conjugato-pinnatus.—When a leaf divides into two arms each of which is pinnated.

Conjugatus.—Paired. When the petiole of a leaf bears one pair only of leaflets.—See *Bifoliolate.*

‡ *Conjunctorium.*—The operculum of the spore-case of an Urn-moss.

Connectivalis.—Of or belonging to the connective.

Connective.—The part which intervenes between the two lobes of an anther and holds them together; it is subject to great diversity of form (EB. 169). It appears to be analogous to the midrib of a leaf, and is only absent when an anther is strictly one-celled; that is to say, when the whole of the interior of the end of the stamen is converted into pollen.

Connivens.—Having a gradually inward direction, as many petals. Converging.

‡ *Conocarpium.*—A fruit consisting of a collection of carpels arranged upon a conical centre, as the Strawberry.

Conoidal.—Resembling a conical figure, but not truly one, as the calyx of Silene conoidea.

‡ *Conostroma.*—A growing point, constituting a free central placenta. See *Endl. Grundz,* p. 264.

Consutus.—When parts are united by a membrane of threads.

Contextus.—Tissue.

‡ *Contematosus.*—Covered by a kind of armature between bristly and aculeate.

Continuous.—The reverse of articulated. A stem is said to be continuous which has no joints.

Contorted.—An arrangement of petals or corolline lobes, when each piece being oblique in figure, and overlapping its neighbour by one margin, has its other margin in like manner overlapped by that which stands next it. (*cxi.*)

CXI.

Contortio.—A twisting.

Contortuplicatus.—Twisted back upon itself. (*cxii.*)

CXII.

Contractus.—But little spreading.

Contrarius.—Opposite to anything.

‡ *Conus.*—See *Strobilus* and *Cone.*

Converginervis.—When the ribs of a leaf describe a curve and meet at the point, as in Plantago lanceolata.

Convexiusculus.—Slightly convex.

Convergenti-nervosus.—When simple veins diverge from the midrib of a leaf and converge towards the margin. (*cxiii.*)

CXIII.

Convolutus, Convolutiva.—When one part is wholly rolled up in another, as in the petals of the Wallflower. (*cxiv.*)

CXIV.

Coppery.—Brownish red, with a metallic lustre.

‡ *Copulative.*—Those dissepiments are thus called which do not separate well from either the axis or walls of a pericarp.

Coralliformis, Coralloides.—Resembling coral in general appearance.

‡ *Cor seminis.*—The embryo.

Coracinus.—Raven-black.

‡ *Corculum.*—The embryo.

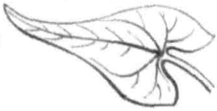
Cordato-hastatus. — Between cordate and hastate. (*cxv.*)

CXV.

Cordato-ovatus.—Between cordate and ovate. (*cxvi.*)

CXVI.

Cordato-sagittatus.— Between cordate and sagittate. (*cxvii.*)



CXVII.

Cordate.—A plane body, having two round lobes at the base; the whole resembling the heart in a pack of cards (EB. 117, d).

Cordiformis.—When a solid has the form of cordate.

Coreses.—Dark red, broad, discoid bodies, found beneath the epicarp of Grapes.

Coriaceous. — Having the consistence of leather.

Corky.—Having the texture of the substance called cork.

Corm.—A fleshy underground stem, having the appearance of a bulb, from which it is distinguished by not being scaly (EB. 103 a, b; SB. 5).

Corneus.—Horny; hard and very close in texture, but capable of being cut without difficulty, the parts cut off not being brittle, as the albumen of many plants.

Corniculatus.—Terminating in a process resembling a horn; as the fruit of Trapa bicornis. If there are two horns the word bicornis is used; if three, tricornis, and so on (VK. 484).

‡ *Corniculiferus.*—Having hollow, horn-like processes, as many Borageworts in the orifice of their corollæ.

Cornu, (adj. *Cornutus*).—A horn-like process, commonly solid (EB. 161, c), and usually a metamorphosed state of some other organ. ‡ Also employed in the sense of Calcar.

Corolla, (adj. *Corollaris, Corollinus*).—That part of a flower which intervenes between the calyx and stamens; its parts are called petals.

‡ *Corolla.*—The annulus of certain Fungals.

‡ *Corollula.*—A small corolla.

Coronula.—The small calyx-like body which crowns the nucule of Chara.

Corona.—A coronet. Any appendage that intervenes between the corolla and stamens, as the cup of a Daffodil (EB. 161, b), or the rays of a Passion-flower (VK. 227, 1).

Corona staminea.—A coronet formed from transformed stamens (EB. 161, d).

Coronans.—Situated on the top of anything. Thus, the limb of the calyx may crown an ovary; a gland at the apex of the filament may crown a stamen.

Coronatus.—Furnished with a coronet; also in the sense of Coronans.

Corpus.—The mass of anything; thus, C. ligneum or lignosum, signifies the mass of the woody tissue of a plant, and C. medullare the mass of its cellular tissue in the pith.

‡ *Corpuscula vermiformia.*—Spiral vessels in a contracted, strangled, disturbed condition.

Corpora carnosa.—The spore-cases of certain Fungals.

‡ *Corpuscula.*—The spore-cases of certain Fungals.

Corrugated, Corrugativus.—When the parts are crumpled up irregularly, as the petals of the Poppy, or the skin of some seeds. (*cxviii.*)

CXVIII.

Cortex.—The *Bark,* (which see.) Also the peridium of certain Fungals.

Cortical integument.—The bark, or false bark of Endogens.

Cortinate, Cortinarious.—Having a cobweb-like texture.

Cortical stratum.—The superficial layer of tissue in the thallus of a Lichen.

Corticatus.—Harder externally than internally. Having a rind.

Cortina.—The filamentous annulus of certain Agarics.

‡ *Corydalineus.*—Resembling the flower of a Fumewort.

Corymb, (adj. *Corymbose*).—A raceme, whose pedicels are gradually shorter as they approach the summit, so that the result is a flat-headed inflorescence, as in Candytuft.

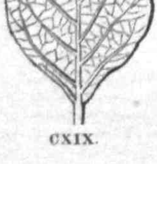
Corymb, compound.—A branched corymb, each of whose divisions is corymbose (EB. 139 f).

Corynidia.—Processes sunk into the margin of the germinating leaf of Ferns, and containing spiral threads.

Costa.—The midrib of a leaf; that part which is a direct extension of the petiole, and whence the veins arise; a leaf may have many costæ.

Costatus.—‡When there is only one rib; as in most leaves. Also the mere adj. of costa.

Costato-venosus.—When the parallel side-veins of a feather-veined leaf are much stouter than those which intervene. (*cxix.*)



CXIX.

Cotyledons.—The seed-lobes; the first leaves in the rudimentary plant or embryo.

Cotyliform.—Dished. Resembling rotate, but with an erect limb.

Crassus.—Something thicker than usual. Leaves are generally papery in texture; the leaves of cotyledons, which are much more fleshy, are called crassa.

Cratera.—The cup-shaped receptacle of certain Fungals.

Crateriformis.—Concave, hemispherical, a little contracted at the base. (*cxx.*)

CXX.

Cream-colour.—White, verging to yellow, with little lustre.

‡ *Cremocarpium.*—Such fruits as that of Umbellifers, consisting of two or more indehiscent inferior one-seeded carpels adhering round a distinct and separable axis.

Crena, Crenatura, Crenel, Crenelling.—A round or convex tooth.

Crenate, Crenelled.—Having convex teeth. (*cxxi.*) When these teeth are them-

CXXI.

selves crenated, bicrenate is the term which is used.

Crenato-dentatus.—Divided at the edge into triangular notches. (*cxxii.*)

CXXII.

Crenato-serratus.—When serratures are convex, and not straight. (*cxxiii.*)

CXXIII.

Crenulatus.—Having the edge divided into small crenels.

Crescent-shaped.—Resembling the figure of the crescent, or young moon. (*cxxiv.*)

CXXIV.

‡ *Crescente-pinnatisectus.*—When the lobes of a pinnated leaf become gradually larger as they approach the end (EB. 120 d).

Crested.—Having an elevated, irregular, or notched ridge, resembling the crest of a helmet. This term is chiefly applied to seeds, (*cxxv.*) and to the appendages of

CXXV.

anthers; it also belongs to bracts which form with their edges an appearance like that of a crest. (*cxxvi.*)

CXXVI.

Cretaceus.—Very dull white, with a little touch of grey.

Cribrosus.—Pierced (like a sieve) with numerous close small apertures.

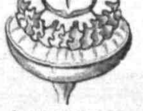
Crinitus.—Having tufts of long weak hairs, growing from different parts of the surface.

‡ *Crispabilis, Crispescens.*—Capable of curling up, or having a tendency to do so. (*cxxvii.*)

CXXVII.

‡ *Crispativus.*—This term has only been used for that kind of vernation in which the surface of a leaf is very much elevated or crumpled.

Cristato-rugosus.—When the wrinkles of a surface are deep and sharp-edged. (*cxxviii.*)



CXXVIII.

Crispatura, (adj. *Crispus*).—When the edge is excessively and irregularly divided

and twisted (EB. 118, e); also when the surface of a leaf is much puckered and crumpled. A diminutive of *Bullate*, (which see).

Cristatus.—See *Crested.*

Croceus, *Crocatus.*—Saffron-coloured.

Crowded.—When parts are pressed closely round each other.

Crowning.—See *Coronans.*

Cruciate, *Cruciformis.*—Having the form of a cross, with equal arms, as the flowers of Crucifers (SB. 100).

Crumpled.—See *Corrrugated.*

Crusta.—The upper surface of Lichens.

Crustaceous.—Hard, thin, and brittle; as the seed-skin of Asparagus.

‡ *Crypta.*—The sunken glands or cysts which occur in dotted leaves.

Cryptos.—In Greek compounds = concealed; thus Cryptogams are plants with concealed sexes.

Cryptonemata.—Small cellular threads produced by Cryptostomata. (*cxxix.*)

CXXIX.

Cryptostomata.—Little circular nuclei found on the surface of some Algals. (*cxxx.*)

CXXX.

Cubit, (adj. *Cubitalis*).—Eighteen inches, or the distance between the elbow and the tip of the fingers.

Cubus, (adj. *Cubicus*).—A right-angled solid, with all the sides equal; a cube.

Cucullus.—A hood or terminal hollow.

Cucullatus.—When the apex or sides of anything are curved inwards, so as to resemble the point of a slipper, or a hood (SB. 232, 1).

Culm, *Culmus*, (adj. *Culmeus*).—The straw of corn; a kind of hollow stem.

Culmifer.—Producing culms.

Cuneatus, *Cuneiformis*, ‡ *Cunearius.*—Wedge-shaped. Inversely triangular, with rounded angles (EB. 118 c).

Cuniculatus.—Pierced with a long deep passage, open at one end, as the peduncle of Tropæolum.

‡ *Cunix.*—The separable place which intervenes between the wood and bark of Exogens.

Cupula.—The cup or husk of the acorn, Spanish Chesnut, &c.; a collection of bracts; a sort of involucre; a cup-like body found in such Fungals as Peziza.

Cupula-shaped, *Cupuliformis.*—Slightly concave, with a nearly entire margin; as the calyx of Citrus, or the cup of an acorn.

Cup-shaped.—A short cylinder, open at one end, rounded at the other, but not contracted at the brim; the whole resembling a drinking-cup (*cxxxi*).

CXXXI.

Curled.—See *Crispatura.*

Curvative.—When the margins are slightly turned up or down, without any sensible bending inwards (*cxxxii*).

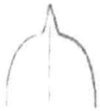
CXXXII.

Curve-ribbed.—When the ribs of a leaf describe curves, and meet at the point; as in Plantago lanceolata.

Curvinervius, *Curvivenius*, *Curve-veined.*—The same as *Convergenti-nervosus*, (which see).

‡ *Cushioned.*—Convex, a little flattened.

Cuspidate.—Tapering gradually into a rigid point; also abruptly acuminate (*cxxxiii.*) as the leaflets of many Rubi.



CXXXIII.

Cuticle.—The external homogeneous skin of a plant, consisting of a tough membrane overlying the epidermis. The word is also used for the skin of anything, including the epidermis.

Cutis.—The Peridium of certain Fungals.

‡ *Cyamium.*—A kind of follicle, resembling a legume.

Cyaneus, in composition *Cyano*, ‡ *Cyanæus*, ‡ *Cyalinus.*—A clear bright blue.

Cyanochrous.—Having a blue skin.

Cyathiformis.—See *Cup-shaped.*

Cyathus.—The cup-like body, which contains propagula in Marchantia.

Cycle.—A term employed in the theory of spiral leaf-arrangement to express a complete turn of the spire which is assumed to exist.

Cyclical.—Rolled up circularly, as many embryos. (*cxxxiv.*)

CXXXIV.

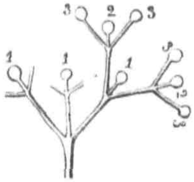
Cyclosis.—A supposed motion of fluids, occurring in the kind of tissue called cinenchyma.

‡ *Cylindrantheræ.*—Same as *Syngenesious.*

‡ *Cylindrenchyma.* — Cylindrical cellular tissue, as that of Confervæ, of many hairs, &c. (EB. 195 a).

‡ *Cylindrobasiostemon.*—When stamens are both syngenesious and monadelphous.

Cyma, Cyme.—A kind of inflorescence, produced by the rays of an umbel forming one terminal flower, and then producing secondary pedicels from below it, in the centrifugal manner, as in a Laurustinus (SB. 41). Its diagram is thus. (*cxxxv.*)



CXXXV.

Cymbiformis 449.—Having the figure of a boat in miniature; that is to say, concave, tapering to each end, with a keel externally; as the glumes of Phalaris canariensis. (*cxxxvi.*)

CXXXVI.

Cymbellæ.—Reproductive locomotive bodies, of an elliptical form, found in some Algals.

Cynarrhodum.—Such a fruit as that of the Rose, in which many bony achænia are inclosed in a fleshy hollow enlargement of the apex of the flower-stalk.

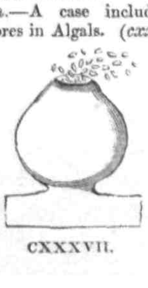
Cyphelia.—Collections of gonidia in the form of cups.

Cyphellæ.—Pale wart-like spots, found on the under surface of the thallus of some Lichens.

Cypsela.—The dry one-celled one-seeded inferior fruit of Composites.

‡ *Cyrrhus.*—See *Cirrhus.*

Cystocarpium.—A case including a great many spores in Algals. (*cxxxvii.*)



CXXXVII.

Cystidia.—Salient cells, accompanying the basidia, or asci of Fungals; by some regarded as antheridia.

Cystis.—The spore-case of certain Fungals.

‡ *Cystula.*—See *Cistella.*

Cytoblast.—The elementary spherule, derived from organic mucus, and producing a cell from its side, according to Schleiden.

Dædaleus. —When a point has a large circuit, but is truncated and ragged. Being wavy and irregularly plaited as the hymenium of some Agarics.

Dealbatus.—Covered with a very opaque white powder.

Deca.—In Greek composition = ten.

Deciduous.—Finally falling off; as the calyx and corolla of Crucifers.

Declinate.—Bend downwards.

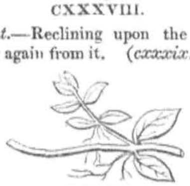
Decoloration.—The absence of all colour.

Decompound, Decompositus.—Having various compound divisions or ramifications.

Decreasingly pinnate.—When leaflets diminish insensibly in size, from the base of the leaf to its apex. (*cxxxviii.*)

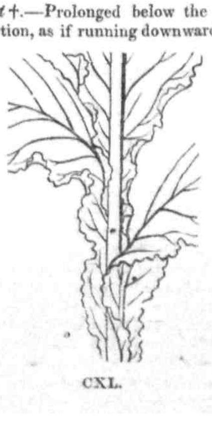
CXXXVIII.

Decumbent.—Reclining upon the earth, and rising again from it. (*cxxxix.*)



CXXXIX.

Decurrent +.—Prolonged below the point of insertion, as if running downwards. (*cxl.*)



CXL.

‡ *Decursively pinnate.*—When a petiole is winged by the elongation of the base of the leaflets; hardly different from pinnatifid.

‡ *Decursivus.*—Same as *Decurrent.*

Decussate.—Arranged in pairs that alternately cross each other. (*cxli.*)

CXLI.

Deduplication.—The supposed unlining process which some Botanists believe in when one organ in a flower is produced opposite another. (See EB. par. 413).

Deferent.—Conveying anything downwards.

Deflexed.—Bent downwards.

Defoliation.—The casting off of leaves.

Deformation.—An alteration in the usual form of an organ by accident or otherwise.

Degradation.—A change consisting of an abstraction, loss, abortion, or non-development of usual organs.

Dehiscence.—The act of splitting into regular parts, or in some manner dependent upon organic structure.

Deliquescens.—Branched, but so divided that the principal axis is lost trace of in ramifications; as the head of an oak tree.

‡ *Deliquium.*—See *Emarginate.*

Deltoid.—A solid, the transverse section of which has a triangular outline, like the Greek Δ. (*cxlii.*) Also applied to the

CXLII.

outline of thin bodies.

Dendroides.—Divided at the top into a number of branches, so as to resemble the head of a tree; only applied to small plants like Mosses. (*cxliii.*)

CXLIII.

Demersus.—Buried beneath water.

‡ *Denarii.*—Ten together.

‡ *Dendrio-thamnodes.*—A thallus, branched like a bush.

Dendron.—In Greek compounds = a tree.

Deni.—Ten together.

Dens.—A toothing, (adj. *Dentate*); having sharp teeth with concave edges. When these teeth are themselves toothed, the part is *duplicato-dentate*, not *bidentate*, which means two-toothed (EB. 119 f). (*cxliv.*)

Dentato-crenatus.—The same as *Crenato-dentatus.*

Dentato-laciniatus.—When toothings are irregularly extended into long points. (*cxliv.*)

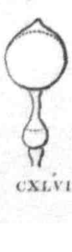
CXLIV.

Dentato-serratus.—When toothings are taper-pointed and curved forwards, like serratures. (*cxlv.*)

CXLV.

Denudatus.—When a surface which has once been hairy, downy, &c., becomes naked.

Deoperculatus.—A term used in describing Mosses, when the operculum will not separate spontaneously from the spore-case. (*cxlvi.*)



CXLVI.

Deorsum.—Downwards.

Depauperatus.—When some part is less perfectly developed than is usual in plants of the same family. Thus, when the lower scales of a head of a Cyperaceous plant produce *no flowers*, such scales are said to be depauperated, or starved.

Dependens.—Hanging downwards.

Depressed.—Broad and dwarf, as if, instead of lengthening perpendicularly, growth had taken place horizontally. (*cxlvii.*)

CXLVII.

Depresso-truncatus.—Same as *Retuse.*

‡ *Deregularis.*—Something between regular and irregular.

Derma.—In Greek compounds = the bark or rind.

‡ *Dermis.*—The skin of a plant.

Descending.—Having a direction gradually downwards.

‡ *Descensus.*—The root.

Desinentia.—The manner in which a lobe terminates.

Desmos.—In Greek compounds = anything bound to another or brought into close contact with it.

Deuterostrophes.—Spirals of a third degree in the development of leaves.

Dextrorsus.—Turned to the right hand.

Dextrorsum-volubilis.—Twisting to the right. (*cxlviii.*)

CXLVIII.

Di.—In Greek compounds = two.

‡ *Diachenium, Diakenium.*—Same as *Cremocarp.*

Diachyma.—The green cellular matter of leaves.

Diadelphous.—Consisting of two parcels of stamens or fraternities (SB. 53).

Diagnoses.—The short characters or descriptions by which plants are distinguished from each other.

Dialypetalus.—The same as *Polypetalous.*

Dialyphyllus.—The same as *Polysepalous.*

‡ *Diaphysis.*—A præternatural extension of the centre of the flower, or of an inflorescence.

Diaphanus, ‡ *Diophanus.*—Transparent, or nearly so.

Dichlamydeous.—Having both calyx and corolla.

‡ *Dichogamus.*—When the florets of an inflorescence are of two separate sexes.

Dichotomia.—A forking or division by two. (adj. *Dichotomus,* ‡ *Dichotomalis*)—Having the divisions always in pairs; a term equally applied to branches, or veins, or forks. (*cxlix.*)

CXLIX.

Diclinous.—Having the stamens in one flower and the pistil in another.

Diclesium.—A one-seeded indehiscent fruit inclosed within a hardened perianth, as in the Marvel of Peru.

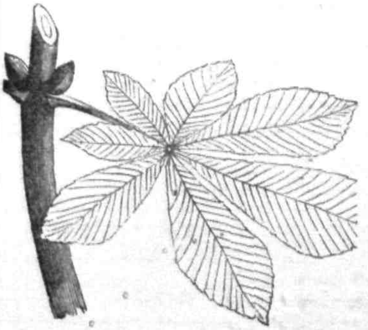
Dicoccus.—Splitting into two cocci.

Dicotyledonous.—Having two cotyledons.

Didymus.—Double; growing in pairs, as the fruit of Umbellifers; ‡ divided into two lobes, like the prongs of a fork.

Didynamous.—Having two stamens longer than the two others (SB. 173, 2).

Digitatus.—When several distinct leaflets radiate from the point of a leaf-stalk. (*cl.*)



CL.

‡ *Dieresilis*, (adj. *Dieresilian*).—The same as *Carcerulus*.
Difformis, (adj. *Difformitas*.)—Deformed; unusual formation.
Diffractus.—Broken to pieces, or seeming to be so.
Diffuse.—Spreading widely.
Diffusus color.—A "run" colour.
Digitaliformis. — Like campanulate, but longer and irregular, as the corolla of Digitalis (VK. 360, 1).
Digitato-pinnate. — When the leaflets of a digitate leaf are pinnate. (*cli.*)

CLI.

Digitinervius.—When the ribs of a leaf radiate from the top of the petiole (EB. 118 e).
Digitus, (adj. *Digitalis*.)—The length of the Index finger.
‡ *Dilaceratus*.—The same as *Lacerus*.
‡ *Dilepidus*.—Consisting of two scales.
Dimidiate.—When one half an organ is so much smaller than the other as to seem as if missing. (*clii.*) Hardly different

CLII.

from oblique, except in degree. Also slit half-way up. (*cliii.*)

CLIII.

Dimidiato-cordatus.—When the larger half of a dimidiate leaf is cordate.
Dimotus.—Somewhat remote from.
Diœcia, (adj. *Diœcius*, *Dioicus*.) — When the sexes of a plant are borne in different flowers by distinct individuals, as in Willows. Expressed by the signs ♂ ♀.

Dioico-polygamus.— When some of the flowers of a diœcious plant produce hermaphrodite flowers.
Dipetalous.—Consisting of two petals.
Diphyllus.—Two-leaved.
Diploe.—That part of the parenchyma of a leaf which intervenes between the two layers of epiderm.
Diplostemonous.—Having twice as many stamens as petals.
‡ *Diplotegia*.—An inferior capsule.
Dipterus.—Having two wing-like processes.
Dipyrenus.—Containing two stones or pyrenæ.
Directé-venosus. — A feather-veined leaf whose secondary ribs (primary veins) pass straight from the mid-rib to the margin (SB. 195, 197, 198).
Disciform.—Flat and circular; the same as orbicular. A name given to the chambered pith of such plants as the Walnut.
Discocarpium.—A collection of fruits placed within a hollowed receptacle, as in many Roseworts.
Discoidal.—Orbicular, with perceptible thickness, slightly convex, and a rounded border. (*cliv.*)

CLIV.

Discolor.—Parts having one surface of one colour, and the other of another colour. Also any green colour altered by a mixture of purple.
Discopodium.—The foot or stalk on which some kinds of disk are elevated.
Discus, *Disk*.—An organ intervening between the stamens and ovary; it assumes many forms, the most common of which is a ring or scales. (*clv.* A.)

A.

CLV.

It is apparently composed of metamorphosed stamens. Also the receptacle of

certain Fungals, or the hymenium of others.

Dissected.—Cut into many deep lobes.

Dissepiments. — The partitions in a fruit caused by the adhesion of the sides of carpellary leaves. *Spurious Dissepiments*, are any partitions in fruit which have not that origin.

Distichous.—When parts are arranged in two rows, the one opposite to the other, as the florets of many Grasses (SB. 241).

Distinct.—Separate from.

Distractile.—Divided into two parts as if torn asunder, like the connective of some anthers (EB. 169 h).

Diurnus.—Enduring but for a day, as the flower of Tigridia.

Divaricating, *Divaricatus*. — Straggling, spreading abruptly, and at an obtuse angle, such as 140°.

Divergence, (adj. *Diverging*).—Spreading away at such an angle as 20° to 40°.

‡ *Diverginervius.*—Having the main ribs radiating.

Diversiflorus.—When a plant or inflorescence bears flowers of two or more sorts.

Diversus.—Variable. *DC.*

Dodeca.—In Greek compounds = 12.

Dodrans, (adj. *Dodrantalis*).—Nine inches, or the space between the thumb and the little finger separated as widely as possible.

Dolabriformis.—Fleshy, nearly straight, somewhat terete at the base, compressed towards the upper end; one border thick and straight, the other enlarged, convex, and thin. (*clvi.*)

CLVI.

Dorsal.—Fixed upon the back of anything.

Dorsiferus.—Bearing something on the back.

Dorsum.—The back of anything; in the parts of the flower, that surface which looks towards the outside.

Dotted.—Furnished with transparent receptacles of oil, looking like dots; marked with punctures.

Double-bearing.—Producing twice in the same season.

Doubly.—Having a form or structure repeated; doubly toothed = teeth themselves toothed, and so on. See *cxliv.*

Downy.—Covered with very short, weak, close hairs.

Drupeola.—A little Drupe.

Drupe, (adj. *Drupaceous*).—A fleshy or succulent fruit, with a bony putamen or lining, as a Plum.

‡ *Drupe, spurious.*—Any fleshy body inclosing a stone.

Ducts.—Tubular vessels marked by transverse lines or dots; apparently in some cases modifications of spiral vessels, when they are called *closed*, *annular*, *reticulated*, and *scalariform*, sometimes analogous to pitted tissue, when they are called *dotted*, and form bothrenchyma (EB. 33, 34, 35, &c.)

Dulcis.—Any kind of taste, which is not acrid.

Dumetum, Dumus.—A low branching shrub.

Duodeni.—Growing twelve together.

Duplex.—Double.

Duplicato-crenatus.—When each crenel is itself crenate.

Duplicato-dentate.—When each toothing is itself toothed.

Duplicato-pinnate.—When the leaflets of a pinnate leaf become themselves pinnate (EB. 120, 1).

Duplicato-serrate.—When each serrature is itself serrated.

‡ *Duplicato-ternatus.*—See *Biternate.*

‡ *Duplicatus.*—Growing in pairs.

Duplo.—Twice as much as, or twice as many as.

Duramen.—Heartwood. That part of the timber of a tree which becomes hardened by matter deposited in it. It is next the centre in Exogens, and next the circumference in Endogens.

‡ *Dyclesium.*—See *Diclesium.*

Dynamis.—A power. A figurative expression employed by Linnæus to express the degrees of development of stamens. Thus his Didynamia signified stamens of two different lengths, or of two different degrees of development.

‡ *Dyplostemones.*—See *Diplostemonous.*

‡ *Dyplotegia.*—See *Diplotegia.*

E, Ex.—In composition = without; thus exalbuminous signifies without albumen.

Eared.—Having two small rounded lobes at the base. See *Auriculate.*

‡ *Ebetatus.*—See *Hebetatus.*

Eborinus.—The colour of ivory.

Ebracteatus.—Having no bracts.

Eburneus.—See *Eborinus.*

Ecalcaratus.—Having no calcar.

‡ *Ecblastesis.*—The production of buds within flowers, in consequence of monstrous development; or on inflorescences.

Edentatus, Edentulus.—Not having any teeth.

Edged.—When one colour is surrounded by a very narrow rim of another.

‡ *Efflorescentia.*—The action of beginning to flower.

‡ *Effœtus.*—Sterile; barren; past bearing.

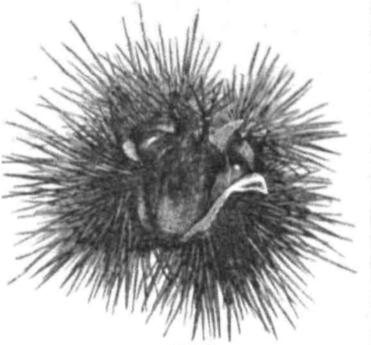
Effoliatio.—The removal of leaves.

‡ *Efulcratus.*—Said of buds, from below which the customary leaf has fallen.

‡ *Egg-shaped.*—See *Ovate.*

Eglandulosus.—Not having any glands.

Echinatus.—Furnished with numerous rigid hairs, or straight prickles; as the fruit of Castanea vesca. (*clvii.*)



CLVII.

‡ *Ehilatus.*—Not having a perforation; only applied to pollen grains.

Elaio.—In Greek compounds = olive colour, a mixture of green and brown.

‡ *Elaterium.*—See *Regma.* A tricoccous fruit.

Elaters.—Spiral elastic threads, generated in tubes in certain Liverworts and Scale-mosses, and supposed to assist in the dispersion of spores (VK. 38, 4).

Elatus.—This is said of plants which are taller than their other organs would have led one to expect.

‡ *Eleutherantherus.*—Having the anthers distinct from each other.

Eleutheros.—In Greek compounds = distinct, separate.

Ellipsoidal.—A solid with an elliptical figure.

Ellipticus.—A flat body, which is oval and acute at each end (SB. 145).

Elongatio.—The act of increasing in length.

Elongatus.—Lengthened or stretched out, as it were.

‡ *Elytriculus.*—A floret.

Emarcidus.—Flaccid, welted.

Emarginatura, (adj. *Emarginate*).—Having a notch at the end, as if a piece had been taken out. (*clviii.*)

CLVIII.

Embolus.—A plug; a process which projects downwards from the upper part of the cavity of the ovary in Armeria, and closes up the foramen of the ovule.

Embracing.—Clasping with the base. See *Amplectans.*

Embryo, (adj. *Embryonalis*).—The rudimentary plant, engendered within a seed by the action of pollen. (*clix.*)

CLIX

Embryo-buds.—Spheroidal solid bodies, of unknown origin, resembling woody nodules, formed in the bark of trees, and capable of extending into branches under favourable circumstances.

‡ *Embryo, fixed.*—A leaf-bud.

‡ *Embryotegium, Embryonitega, Em'ry tega.*—A little papilla, often separating as a lid, which covers over the radicle of some kinds of embryo. (*clx.*) It is the hardened apex of the nucleus.

CLX.

‡ *Empennatus.*—Pinnated.

‡ *Emphysematosus.*—Bladdery, resembling a bladder.

Endeca.—In Greek compounds = eleven.

Endocarp.—The lining of a carpel; the inner surface of a fruit, representing at that time the upper surface of a carpellary leaf. The stone of a cherry is its endocarp.

‡ *Endochroa.*—A supposed interior layer of the cuticle.

Endochrome.—The colouring matter of plants In Algals the colouring matter found in the cells; sometimes the entire contents of their cells.

Endogenous.—Growing by the addition of new wood to the centre of the stem.

Endogonium.—The contents of the nucule of a Chara.

Endophlœum.—The liber of bark; the inner layer, containing woody tissue, lying next the wood.

‡ *Endophragma.*—A partition in the interior of the frond of some Seaweeds.

‡ *Endophyllous.*—Formed from within a sheathing leaf; as the young leaves of Endogens.

Endopleura.—The innermost skin of a seed-coat.

‡ *Endoptile.*—Said of an embryo whose plumule is rolled up by the cotyledon, as in Endogens.

‡ *Endophyte.*—The woody body, or timber of an Exogen, including the pith.

‡ *Endostere.*—The same without the pith.

Endorhizal.—That kind of germination in which the original radicle forms a sheath round the first root which comes from within the former. (EB. 226).

Endos.—In Greek composition = within, or in the inside of anything.

Endosmosis.—That force which causes a viscid fluid lying within a cavity to attract to itself a watery fluid through an organic membrane.

‡*Endospermium.*—Albumen. ‡*Endospermicus.*—Having Albumen.

‡ *Endosporus.*—Containing spores in the inside, as Puffballs.

Endostome.—The aperture in the inner integument of an ovule.

Endothecium.—The lining of an anther.

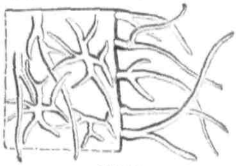
Enervis.—When there are no ribs or veins visible.

Ennea.—In Greek compounds = nine.

Enodis.—Without joint or node.

Ensiformis, Ensatus.—Quite straight, with the point acute, like the blade of a broadsword or the leaf of an Iris (SB. 8).

Entangled.—Intermixed in so irregular a manner as not to be readily disentangled, such as the hairs, roots, and branches of many plants. (*clxi.*)



CLXI.

Entire.—Having no kind of marginal division; ‡ also nearly destitute of marginal division, and ‡ not pinnatifid.

Entophytes.—Plants which grow from within others, as some Rhizanths and Fungals.

Ephemerus.—Enduring but a day.

Epi.—In Greek compounds = upon.

‡ *Epiblastus.*—A small transverse plate, (a second cotyledon), found on the embryo of some Grasses.

Epiblema.—An epidermis consisting of thick-sided flattened cells.

‡ *Epicalyx.*—The involucellum, or external series of envelopes beyond the calyx, as in Malva.

Epicarp.—The outermost layer of the pericarp, corresponding with the under side of the carpellary leaf.

Epichilium.—The upper half of the lip of an Orchid, when that organ is once jointed or strangulated. (*clxii. a.*)

CLXII.

‡ *Epichroa.*—A supposed external layer of the cuticle.

Epiclinal.—Placed upon the disk or receptacle of a flower.

Epidermis.—The true skin of a plant below the cuticle.

Epidermoid.—Of or belonging to the skin.

‡ *Epigenus.*—Growing upon the surface of a part, as many Fungals on the surface of leaves.

Epigeous.—Growing close upon the earth.

Epigonium.—The membranous bag or flask which incloses the spore-case of a Liverwort or Scale-moss when young. Also the nucule of a Chara (VK. 13, 5).

‡ *Epigynophorius.*— Placed upon a gynophore or stipe of an ovary.

Epigynous, ‡ *Epigynicus*, ‡ *Epimenus.*—Appearing to grow upon an ovary or style, as the disk of Umbellifers (SB. 135).

Epipterus, ‡ *Epipteratus.*—Having a wing at the summit. (*clxiii.*)

CLXIII.

Epipetalus.—Growing on petals.

Epiphlœum.—The layer of bark immediately below the Epiderm. The cellular integument of the bark.

‡ *Epiphlosa.*—The Epiderm.

Epiphragma—A membrane drawn over the mouth of the spore-case in Urn-mosses, and closing it up.

Epiphytal.—Growing upon some other plant without deriving any nutrition from its juices, as Mosses, Orchids, &c.

Epiphyllous.—Inserted upon a leaf.

‡ *Epiphyses.*—Warts or protuberances growing round the hilum or foramen of certain seeds. Same as *Strophiolæ.*

Epiphyte.—Plants which grow upon the surface of others, as many Mosses and Orchids.

‡ *Epipodium.*—A form of disk consisting of glands upon the stipe of an ovary. (*clxiv.*)

CLXIV.

Also the stalk of the disk itself.

Eiperidium.—The peridium or receptacle of certain Fungals.

Epirhizus.—Growing on a root.

‡ *Episperm.*—The skin of a seed.

Episporangium.—The indusium of a Fern when it overlies the spore-cases, as in Aspidium (VK. 55, 2).

Episporium.—A skin which covers some spores.

Epithelium.—An epidermis consisting of young thin-sided cells, filled with homogeneous, transparent, colourless sap.

Epizous.—Growing on living animals.

Eplicatus.—Not plaited.

Equally pinnate.—When the petiole of a pinnate leaf is terminated by neither leaflet nor tendril.

Equitant, ‡ *Equitativus.* — When the two sides of a leaf are brought together and adhere except at the base, where they inclose an opposite leaf whose sides are in the same state. Hence they look as if they rode on each other. (*clxv.*)

CLXV.

Eramosus.—Unbranched.

‡ *Eremus.*—A ripe carpel separating from its neighbours, and standing apart (VK. 327, 3).

Ericetinus.—Living in the tracts of country called Heaths.

Erigens.—When a horizontal branch rises upwards at the point.

‡ *Erisma.*—The rachis or axis of Grasses.

Erion.—In Greek compounds = woolly.

Eroso-dentatus.—Toothed in a very irregular manner, as if bitten. (*clxvi.*)

CLXVI.

Erostris.—Not having a beak.

Erosus, Eroded.—Having the margin irregularly toothed, as if bitten by an animal.

Erythro.—In Greek compounds = any pure red.

Erythrophyll.—The red colouring matter of plants.

‡ *Erythrostomum.*—Any aggregate fruit like that of a Strawberry or Ranunculus.

Escens.—A termination equivalent to the English ish; thus, rub*escens* = redd*ish*.

‡ *Espathatus.*—Not having a spathe.

Estivation.—The manner in which the parts are arranged in a flower-bud.

‡ *Etrabeculatus.*—Not cross-barred; a term applied to the teeth of some Urn-mosses.

‡ *Etærio, Etairium*, (adj. *Etairionar*).—Such a kind of aggregate fruit as that of the Ranunculus or Strawberry.

Etiolated.—Deprived of colour by being kept in the dark; blanched.

‡ *Eustathe.*—The external layer of a cell.

Evanescenti-venosus. — When lateral veins disappear within the margin (SB. 201).

Evenness.—An absence of elevations or depressions.

Evergreen.—Continuing to bear green leaves all the year round.

Evittatus.—Not striped. Destitute of vittæ.

Evolutio.—The act of development.

Ex.—See *E.* But *exo* signifies outwards or external, as in Exo-gens and exintine, quasi exo-intine.

Exalbuminosus.—Having no albumen.

Exaltatus.—Lofty.

Exanthemata. — Skin diseases; blotches of leaves, &c.

‡ *Exanthium.*—Bractlets of the last degree, incapable of forming axillary buds and immediately external to a flower.

‡ *Exapophysatus.*—Destitute of an Apophysis.

Exareolatus.—Not spaced out.

Exaristatus.—Destitute of an arista, awn, or beard.

Exasperatus.—Covered with hard short stiff points. (*clxviii.*)

CLXVIII.

Excentricus.—Out of the centre.

Excipulus.—That part of the thallus of a Lichen which forms a rim and base to the shield. (*clxix.*) Also a similar

CLXIX.

part in certain Fungals.

‡ *Excrescent.*—See *Accrescent.*

Excurrent.—Running out; as when a stem remains always central, all the other parts being regularly disposed round it; as the stem of a Fir tree.

Excretion.—Any superfluous matter thrown off by the living plant externally.

‡ *Exesus.*—Eaten away; as when a surface is irregularly sculptured, as if it had been worm-eaten or corroded.

‡ *Exhalantia vasa.*—Imaginary vessels found in the epidermis. They are in reality the sides of confluent cells.

Exilis.—Long and straight; slender.

Exindusiatus.—Not having an indusium.

Exintine.—The middle coat of a pollen grain, or, if three or four coatings are present, then that which is next the intine.

‡ *Exœmum.*—A fringe or double tuft of hairs at the base of the glumes of some Grasses.

Exogenous.—Growing by addition to the outer parts of the stem.

‡ *Exophyllous.*—Having naked cotyledons, as in all Exogens.

‡ *Exoptilis.*—Said of an embryo whose plumule is naked upon or between cotyledons, and not rolled up in one.

‡ *Exorhizal.*—That kind of germination in which the point of the radicle itself becomes the first root.

Exosmose.—That force which causes a viscid fluid lying on the outside of an organic membrane to attract watery fluid through it.

Exostome.—The aperture in the outer integument of an ovule.

Exostosis.—A woody lump or tubercle, such as is formed at the roots of some trees.

‡ *Exostylus.*—A fruit like that of Labiates.

‡ *Exothecium.*—The outer coat of an anther.

Explanatus.—Flattened out.

‡ *Exquisitus.*—This is said of parts which are much larger or more highly coloured than such parts usually are. Thus the bracts of a Coma are *br. exquisitæ.*

Exserted.—Projecting beyond the orifice of an organ. (*clxx.*)

CLXX.

Exsuccus.—Juiceless.

Extensibility.—The property of stretching.

Extine.—The outer coat of a pollen grain.

Extra.—On the outside of, or beyond; as *Extra-axillaris*, beyond the axil; *Extra-foliarius*, beyond a leaf; *Extramedianus*, beyond the middle.

Extrarius.—Placed on the outside.

Extrorsus.—Turned outwards from the axis of growth of the series of organs to which it belongs.

Eye.—A term in gardening for a leaf-bud.

Facies.—The general appearance of a plant.

Falcate.—Plane and curved, with parallel edges, like the blade of a reaper's sickle; as the pod of Medicago falcata: any degree of curvature, with parallel edges, receives this name.

False Bark.—That layer on the outside of the stem of an Endogen, which consists of cellular tissue into which fibrous tissue passes obliquely.

Falsinervis.—When veins have no vascular tissue, but are formed of simple, elongated, cellular tissue; as in Mosses, Sea Weeds, &c.

Fan-shaped.—Plaited like a fan; as the leaf of Borassus flabelliformis.

Farctus.—Filled full of anything, as an orange with pulp.

Fariam.—In rows; as *Bifariam*, in two rows; *Trifariam*, in three rows, &c.

Farinaceous.—Having the texture of flour, as the albumen of Wheat.

Farinosus.—Covered with a white mealy substance, as the leaves of Primula farinosa.

Fascia, (adj. *Fasciatus*).—A cross band of colour.

Fasciated.—When a stem becomes much flattened instead of retaining its usual cylindrical figure, ‡ as in the Cockscomb, &c. (*clxxi.*)

CLXXI.

Fasciarius.—Narrow; very long, with the two opposite margins parallel, as the leaves of the Seawrack.

Fasciculato-ramosus.—When branches or roots are drawn closely together so as to be almost parallel.

Fastigiate.—When all the parts are nearly parallel, with each pointing upwards to

the sky, as the branches of the Lombardy Poplar.

Fascicle, Fascicled, Fasciculated.— When several similar things proceed from a common point, as the leaves of the Larch, or the tubers of a Dahlia. (*clxxii.*)

CLXXII.

Faux.—The orifice of a calyx or corolla.

‡ *Faveolatus.*—Honey-combed. See *Favosus.*

Favilla, Favillidium.—See *Cystocarp.*

Favosus.—Excavated in the manner of a section of honey-comb, as the receptacle of many Composites.

Favoso-areolatus.—Divided into spaces resembling the cavities of honeycomb.

‡ *Favoso-dehiscens.*—Appearing honeycombed after dehiscence, as the anther of Viscum (EB. 172 b).

Feather-veined.—Having veins which proceed from a midrib at an acute angle.

Feathery.—Consisting of long hairs which are themselves hairy, as the pappus of Leontodon Taraxacum.

Felleus.—Bitter as gall.

Fenestra, (adj. *Fenestrate.*)—An opening through a membrane, like a window in a wall. (*clxxiii.*)

CLXXIII.

Fer, ferus.—A Latin termination signifying the carrying of something, as *florifer*, the carrier of flowers.

Ferrugineus.—Light brown, with a little mixture of red.

Fertilis.—Having the power of producing perfect seeds; or fertilized; or producing large quantity of seeds.

Fetidus.—Having a disagreeable smell of any kind.

Fibrous.—Containing a great proportion of woody fibre; as the rind of a Cocoa-nut.

Fibre elementary.—That thread which is turned round the interior of the tubes that are called spiral vessels, or of any similar kind of tissue (EB. 30).

Fibrillæ, (adj. *Fibrillosus*).—The roots of Lichens; any kind of small thread-shaped root; also applied occasionally among Fungals to the stipe.

Fibrovascular.—Consisting of woody tissue and spiral or other vessels.

Fiddle-shaped.—Obovate, with one or two deep recesses or indentations on each side (EB. 119 d).

Fidus, Fissus.—Divided *half-way* into two or more parts.

‡ *Fila adductoria.*—The abortive pistillidia of Mosses.

Fila succulenta.—The jointed threads which are mixed with the antheridia in Mosses (VK. 44, 7).

Filament.—The stalk of the anther. Any kind of thread-shaped body.

‡ *Filicology.*—That part of Botany which treats of Ferns.

Filiform, Filiformis.—Slender, like a thread.

Fimbria.—A fringe. An elastic toothed membrane, situated beneath the operculum in Urn-mosses.

Fimbriated.—Having the margin bordered by long slender processes.

Fimbriato-laciniatus.—Having the edge cut up into divisions which are fimbriated.

Fimbrilliferus.—Bearing many little fringes, as the receptacle of some Composites.

Fimetarius.—Growing on or among dung.

Fingered.—See *Digitate.*

Fissiparous.—Propagating by a subdivision of the interior of a cell into two or more other cells, by the production of a membranous partition or septum, from the lining of the mother cell.

Fissus.—Divided *half-way;* usually into a determinate number of segments. We say *Bifidus*, split in two; *Trifidus* in three; and so on. When the segments are very numerous *Multifidus* is used.

Fistular, Fistulous.—This is said of a cylindrical or terete body which is hollow, but closed at each end, as the leaves and stems of the Onion.

Flabellatus, Flabelliformis. — See *Fanshaped.*

Flaccidus.—Welted; or relaxed in consequence of the loss of moisture.

Flagelliformis. — Long, taper, and supple, like the thong of a whip.

Flame-coloured, Flammeus.—Very lively scarlet; fiery red.

Flavedo.—Yellowness; a disease in which the green parts assume that colour.

Flavescens, Flavidus, Flavus.—A pure pale yellow.

Flavovirens. — Green, much stained with yellow.

Flesh, (of vegetable bodies).—The soft parts.

Flagellum.—‡ A twig, or small branch; also a runner like that of the Strawberry. (*clxxiv.*)

CLXXIV.

Flexuose.—Zig-zag; having a wavy direction, gently bending alternately inwards and outwards. (*clxxv.*)

CLXXV.

Flocci.—Woolly threads, found mixed with sporules in Fungals; also any wool-like hairs.

Floccose.—Covered with close hairs, which fall away in little tufts.

Floral.—Of, or belonging to the flower.

Floral Envelopes.—The calyx and corolla, one or both.

‡ *Florescentia.*—See *Anthesis.*

Florets.—When many small flowers are collected in clusters or heads, each flower is called a floret. *Florets of the disk*, are those which occupy the centre of the head of a Composite; on the other hand, *Florets of the ray* occupy the circumference.

Florifer.—Flower-bearing.

Floriferæ gemmæ.—Buds which produce flowers; flower-buds.

‡ *Floriparus.*—Producing a flower. Also a monstrosity consisting in the production of other flowers instead of fruit.

Florus.—In composition signifies flowered; as *Uniflorus*, which is one-flowered; *Biflorus*, two-flowered.

Flos.—A flower; that is to say, an assemblage of organs of which the stamens or pistil, one or both, form a part.

‡ *Flos compositus.*—An old name for the capitulum.

Flosculi, (adj. *Flosculosus*).—Same as *Florets.*

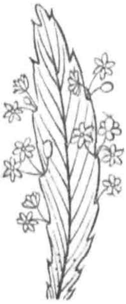
Flower.—See *Flos.*

Fluitans.—Floating upon the surface of water.

Fluvialis, Fluviatilis.—Of, or belonging to the water.

Fœmineus.—Bearing pistils only.

Foliaceus.—Having the texture or form of a leaf, (*clxxvi.*) as the branches of Xylophylla.



CLXXVI.

Foliaris.— Inserted upon, or proceeding from the leaf; thus a *cirrhus foliaris* is a tendril growing from a leaf.

Foliation.—The act of leafing.

Foliatus.—Clothed with leaves.

Foliiferæ gemmæ.—Leaf-buds.

‡ *Foliiformis.*—See *Foliaceus.*

‡ *Foliiparus.*—Producing leaves only, as leaf-buds.

Foliola, (adj. *Foliolatus.*)—A leaflet. The secondary divisions of a compound leaf. In the annexed leaf there are many folioles. (*clxxvii.*)

CLXXVII.

‡ *Folioneanus.*—Growing from the extremity of a leaf.

Foliosus.—Covered closely with leaves.

Folliculus.—A kind of fruit, consisting of a single carpel, dehiscing by the ventral suture only. (*clxxviii.*)

CLXXVIII.

Fontinalis, *Fontanus.*—Growing in or near a spring of water.

Foramen.—An aperture. The foramen of an ovule is an aperture through the integuments, allowing the passage of the pollen tubes to the nucleus (EB. 190).

‡ *Foraminulosus.*—Marked with little holes.

Foraminula.—The ostiolum of certain Fungals.

Forcipatus.—Forked, like a pair of pincers.

Fornix.—Little arched scales in the orifice of some flowers.

Fovea, (adj. *Foveatus*, dim. *Foveolatus.*)—A small excavation or pit. Pitted (*clxxix.*)

CLXXIX.

Foveola.—The perithecium of certain Fungals.

Fovilla.—The imaginary fluid or emanation which it was formerly thought that the pollen discharged when performing the act of fertilization. The fluid actually contained in the pollen-grain.

Foxglove-shaped.—See *Digitaliformis.*

‡ *Fracidus.*—Of a pasty texture; between fleshy and pulpy.

Free.—Not adhering to anything else; not adnate to any other body.

Fringed.—See *Fimbriatus.*

Frond, *Frons.*—A combination of leaf and stem, as in many Algals and Liverworts; also improperly applied to a leaf which bears reproductive bodies, as that of dorsiferous Ferns. Linnæus applied it to Palm leaves, and so destroyed its meaning.

‡ *Frondescentia.*—The mode of bursting into leaf.

‡ *Frondosus.*—Covered with leaves; bearing a great number of leaves.

‡ *Frondiparous.*—A monstrosity, consisting in the production of leaves instead of fruit.

Fructification.—The parts of the flower; more properly the fruit and its parts.

‡ *Fructiparous.*—A monstrosity, consisting in the production of several fruits instead of the one which is metamorphosed.

Frosted.—A term applied to surfaces in which a dewy appearance is opaque, as if the drops were congealed.

Fruit.—That part of a plant which consists of the ripened carpels and the parts adhering them.

Fruits, spurious.—Certain kinds of inflorescence which grow up with the fruit, and form one body with it, as a Pine cone.

Frustula, *Frustilla.*—The joints into which the Brittleworts separate.

Frustulosus.—Consisting of small fragments.

Frutex, (adj. *Fruticosus, escens*).—A shrub; a woody plant which does not form a trunk, but divides into branches nearly down to the ground.

Fruticulus.—A small frutex or shrub.

Fugacious, *Fugax.*—Falling off, or perishing very rapidly.

Fulciens.—Supporting or propping up anything; said of one organ which is placed beneath another.

‡ *Fulcra*, (adj.) *Fulcratus.*—Additional organs, such as pitchers, stipules, tendrils, spines, prickles, hairs, &c.

‡ *Fulcraceus.*—Of or belonging to the fulcra.

Fuligineus, *Fuliginosus.*—Dirty brown, verging upon black.

Fulvus.—Dull yellow, with a mixture of grey and brown.

Fumeus, *Fumosus.*—Grey, changing to brown; smoke-coloured.

‡ *Funalis.*—Formed of coarse fibres resembling cords.

‡ *Fundimentalius.*—Constituting the essential part of anything, as the axis and its appendages of a plant.

‡ *Fundus plantæ.*—The collar or place of junction of root and stem.

Fungiformis, *Fungilliformis.*—Cylindrical, having a rounded, convex, overhanging extremity. (*clxxx.*)

CLXXX.

Funginus.—Of or belonging to a Fungus.

Funiculus, *F. umbilicalis.*—The cord or thread which sometimes connects the ovule or seed to the placenta. (*clxxxi.*)

CLXXXI.

‡ *Funiliformis.*—See *Funalis.*

Furcatus.—Having long terminal lobes, like the prongs of a fork; as Ophioglossum pendulum.

Funnel-shaped.—A calyx or corolla, or other organ, in which the tube is obconical, gradually enlarging upwards into the limb, so that the whole resembles a funnel (*clxxxii.*)

CLXXXII.

Furfuraceus.—Scurfy; covered with soft scales, which are easily displaced.

Furrowed.—Marked by longitudinal channels; as the stem of the Parsnep.

Fuscus.—Brown, tinged with greyish or blackish.

Fusiformis, ‡ *Fusinus.*—Thick, tapering to each end; as the root of the long Radish. ‡ Sometimes conical roots are called fusiform.

Gala, Galacto.—In Greek compounds = milk or white as milk.

Galactites.—White as milk.

Galbulus.—A strobilus, whose scales are fleshy, and combined into a uniform mass.

Galea.—The helmet or arched part of a flower, always placed at the back; that is, next to the axis (EB. 150 b).

Galla.—A gall; a tumour usually woody, produced by the puncture of an insect.

‡ *Gamomerius.*—A flower whose parts are united by their edges.

Gamo.—In Greek compounds = united by the edges; thus *Gamophyllus* signifies leaves united by the edges, while *Gamosepalous* = monosepalous, and *Gamopetalous*, monopetalous.

Ganglia.—The mycelium of certain Fungals.

Gangræna.—A disease ending in putrid decay.

Gelineæ.—Cells in Algals secreting vegetable jelly.

Geminatus.—United or collected in pairs.

Gemini.—Two together.

Geminiflorus.—Two flowers growing together.

Gemma.—A leaf-bud.

Gemmatio.—The act of budding; the manner in which young leaves are folded up in the bud prior to its unfolding.

‡ *Gemmule.*—The plumule; also the ovule.

Geniculate, Geniculatus.—Bent abruptly like a knee; as the stems of many Grasses.

Gemmæ.—Small reproductive bodies found in some Liverworts, and regarded as being analogous to leaf-buds. (*clxxxiv.*)

CLXXXIV.

‡ *Geniculum.*—The node of a stem.

Geothermometer.—A thermometer constructed especially for determining the temperature of the earth.

Gerontogæus.—Of or belonging to the old world.

Germen.—The ovary.

‡ *Germinal processes.*—Parts belonging to or proceeding from the germen or ovary.

Germination.—The first act of growth by an embryo plant, connected with the absorption of oxygen and the extrication of carbonic acid. Germination ceases when the latter begins to be decomposed.

Gibber.—A pouch-like enlargement of the base of a calyx, corolla, &c. (*clxxxv.*)

CLXXXV.

‡ *Gibberosus.*—See *Gibbosus.*

Gibbositas.—See *Gibber.*

Gibbous. More convex or tumid in one place than another.

Gills.—The lamellæ or plates growing perpendicularly from the cap or pileus of an Agaric.

Gilvus.—Dull yellow, with a mixture of grey and red.

Githagineus.—Greenish-red.

Glaber, Glabratus.—Smooth; having no hairs.

Gladiatus.—See *Ensiformis.*

Glandaceus.—Yellowish brown, the colour of an acorn.

Glandular. — Covered with hairs bearing glands upon their tips; as the fruit of Roses, the pods of Adenocarpus. (*clxxxvi.*)

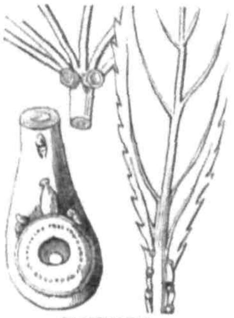
CLXXXVI.

Glans.—An inferior fruit, one-celled by abortion, not dehiscing, containing one or two seeds, and seated in a cupule.

Glareosus.—Growing in gravelly places.

Glaucescens.—Dull green, passing into greyish blue.

Glands, Glandulæ. — Wart-like swellings found on the surface of plants, or at one end of their hairs; they are extremely various in form. (*clxxxvii.*)



CLXXXVII.

Glandulosus, Glanduliferus.—Bearing glands.

Glanduloso-serratus. — Having serratures tipped by glands. (*clxxxviii.*)

CLXXXVIII.

Glaucous.—Covered with a fine bloom, like the Plum or the Cabbage-leaf.

Gleba, Glebula.—The peridium or the fleshy part of certain Fungals.

Glebulæ, (adj. *Glebulosus*).—Little roundish elevations of the thallus of Lichens; also the spores of certain Fungals.

Globi spermatici.—The spores of certain Fungals.

Globose.—Forming nearly a true sphere. (*clxxxix.*)

CLXXXIX.

Globulus.—A round deciduous shield, found in such Lichens as Isidium, formed of the thallus, and leaving a hole where it falls off. (*cxc.*)

CXC.

Globuline.—Elementary cells; starch grains.

Globulus.—A kind of perithecium occurring among Fungals. The antheridium of Chara (VK. 13, 3).

Glochis, (adj. *Glochidatus,* ‡ *Glochideus, Glochidiatus*). — Hooked back at the point, like a fish-hook (EB. 73 o p).

Gloiocarpus.—The quadruple spore, or tetrachocarp of some Algals.

Glomeratus.—Collected into close heads or parcels.

Glomeruli.—See *Soredia.*

Glomerulus, ‡ *Glomus.*—A cluster of capitula inclosed in a common involucre, as in Echinops.

Glossology.—That part of Botany which teaches the meaning of technical terms.

‡ *Glumella.*—That part of the flower of a Grass now called the palea. Also, in the language of Richard, one of the hypogynous scales in such a plant.

‡ *Glumelleanus.* — Of or belonging to the glumella.

‡ *Glumellula.*—The hypogynous scale in the flower of a Grass.

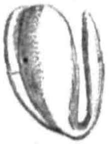
Gluma.—The exterior series of the scales which constitute the flower of a Grass.

Glutinium.—The flesh of certain Fungals.

Glutinosus.—Covered with a sticky exudation.

Gnawed.—See *Erosus.*

Gnomonical.—Bent at right angles. (*cxci.*)



CXCI.

‡ *Gnomonico-areolatus.*—Divided into rectangular spaces.

Goblet-shaped.—See *Crateriform.*

Gongylus.—See *Gonidia.* The spores of certain Fungals. Also a round, hard, deciduous body connected with the reproduction of certain Sea-weeds.

Gongylodes.—Having an irregular roundish figure.

Gonidia.—Green reproductive granules found in the medullary layer of Lichens, immediately below the surface.

‡ *Gonimic.*—Organizable, or contributing to organization.

Gonophorum.—A short stalk which bears the stamens and carpels in such plants as Anonads, &c. (VK. 290 bis. 1).

Gracilis.—A long narrow object.

Grammicus.—When the spots upon a surface assume the form and appearance of letters (VK. 29, 6).

‡ *Grammopodius.*—Having a striped stalk.

Grana tetrasticha.—The spores of certain Fungals.

Graniticus.—Growing in granitic soil.

Granular, Granulatus.— Divided into little knobs or knots; as the roots of Saxifraga granulata.

Granules.—Any small particles; grains; the hollow shells which constitute pollen.

Granula.—Large spores contained in the centre of many Algals, as Gloionema. (*cxcii.*)

CXCII.

Among Fungals it sometimes expresses a spore-case.

Grass-green.—Clear, lively green, without any mixture.

Graveolens.—Strong-scented; having a smell which is unpleasant because of its intensity.

Griseus.—Pure grey, a little verging to blue.

Grossification. — The swelling of the ovary after fertilization.

Grossus. — Coarse ; larger than usual ; as *Grosse crenatus*, coarsely crenated; *Grosse-serratus*, coarsely serrated. (*cxciii.*)

CXCIII.

Growing point.—The soft centre of a bud, over which the nascent leaves are formed ; and all modifications of it.

Grumous. — Divided into little clustered grains ; as the fæcula in the stem of the Sago Palm.

Guttatus.—Colour disposed in small spots.

‡ *Gymnocidium.*—The swelling occasionally found at the base of the spore-case of Urn-mosses.

‡ *Gymnogynus.*—Having a naked ovary.

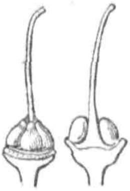
Gymnos.—In Greek compounds = naked, or uncovered.

‡ *Gymnotetraspermus.* — Having such a 4-lobed ovary as is found in Labiates, which was formerly thought to consist of four naked seeds.

Gynixus, Gynizus.—The depressed stigmatic surface of Orchids (VK. 119, 4.)

Gynœcium.—The pistil, and all that belongs to it.

Gynobase.—The growing point inserted between the base of carpels in a conical manner, so as to throw them into an oblique position. (*cxciv.*)



CXCIV.

Gynandrous.—Having the stamens and style and ovary all blended into one common body, as in Orchids, Aristolochia. (*cxcv.*) &c.

CXCV.

Gynophore, (adj. ‡ *Gynophoratus*, ‡ *Gynophorianus*).—The stalk of the ovary, within the origin of the calyx (EB. 169 a).

‡ *Gynostemium.*—The column of Orchids; that is to say, the part formed by the union of stamens, style, and stigma (VK. 119.)

‡ *Gypseus.*—See *Cretaceus.*

Gyratus.—See *Circinatus.*

Gyroma, Gyrus.—The ring or articulated circle which surrounds the spore-cases of Ferns. (*cxcvi.*)

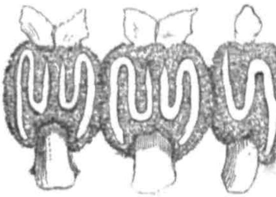
CXCVI.

Also a button-like shield, such as is

found in the genus Gyrophora.—See *Trica.* (*cxcvii.*)

CXCVII.

‡ *Gyrosus.*—Bent backwards and forwards as the anthers of Cucurbits. (*cxcviii.*)



CXCVIII.

Habitat.—The situation in which a plant grows in a wild state.

Habitus.—The general appearance of a plant; its manner of growth, without reference to details of structure.

Hœmatiticus.—Dull red, with a slight mixture of brown.

Halbert-headed.—Abruptly enlarged at the base into two diverging lobes, like the head of a halbert (EB. 118 f).

Half.—Sometimes used in the sense of one-sided; as half-cordate, which signifies cordate on one side only. (*cxcix.*)

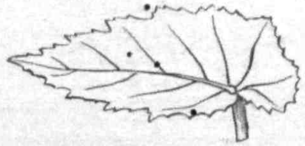
CXCIX.

Half-netted.—When of several layers of anything, the outer one only is netted; as in the roots of Gladiolus communis.

Half-stem-clasping.—Clasping the base in a small degree.

Half-terete.—A long narrow body, flat on one side, convex on the other.

Halved.—When the inequality of the two sides of an organ is so great that one half of the figure is either wholly or nearly wanting, as the leaf of many Begonias. (*cc.*)



CC.

Hair-pointed.—Terminating in a very fine weak point.

Hair shaped.—The same as filiform, but more slender, so as to resemble a hair; it is often applied to the fine ramifications of the inflorescence of Grasses.

Hair's-breadth.—See *Capillus.*

Hairs.—Small, delicate, transparent, conical expansions of the epidermis, consisting of one or more cells (EB. 73.)

Hairy.—Covered with short, weak, thin hairs.

Half-monopetalous.—Having the petals united, but so slightly, that they easily separate.

Hamato-serratus.—When serratures have a somewhat hooked form. (*cci.*)

CCI.

Hami, (adj. *Hamatus,* ‡ *Hamosus*).—Hooks, hairs, or small spines which are hooked at the point. (*ccii.*)

CCII.

Hamulosus.—Covered with little hooks.

Hamulus.—A kind of hooked bristle found in the flower of Uncinia. Schleiden regards it as a third glume, free from the two which form the flask.

Hastatus.— See *Halbert-headed.*

Hauriens (radix).—See *Haustorium.*

Haustorium.—A small root which attaches itself to the surface of some other plant, and lives by sucking it. A sucker, as in Dodder, Ivy, &c.

Heart-shaped.—See *Cordatus.*

Heart-wood.—The central part of the timber of Exogens, hardened or altered by age.

‡ *Hebetatus.*—Having a soft obtuse termination.

‡ *Hegemon.*—Fibrovascular tissue.

‡ *Helicogyratus.*—Having a ring or gyrus carried obliquely round it. (*cciii.*

CCIII.

Helicoid.—Twisted like the shell of a snail.

Helmet.—See *Galea.*

Helvolus.—Greyish-yellow, with a little brown.

Hemi.—In Greek compounds = half, or halved.

Hemianatropous.—An ovule which is anatropal with half the raphe free. (*cciv.*)

CCIV.

‡ *Hemigoniaris.*—A flower, a part of both whose sexes is changed into petals.

‡ *Hemigyrus.*—The same as *Follicle*, which see.

‡ *Hemisyngynicus.*—Half-adherent.

‡ *Hemiteria.*—A monstrosity of elementary organs, or of appendages of the axis.

‡ *Hemitrichus.*—Half covered with hairs.

Hemitropal.—A slight modification of the anatropal ovule, in which the axis of the nucleus is more curved. (*ccv.*)

CCV.

‡ *Henslovian membrane.*—The cuticle; so called because Professor Henslow was one of its discoverers.

Hepta.—In Greek composition = 7.

Hepaticus.—Dull brown with a little yellow.

Herbaceous.—Merely green, or thin, green, and cellular, as the tissue of membranous leaves. Also producing an annual stem from a perennial root.

Herbarium.—A collection of dried plants systematically arranged.

Hermaphroditus.—Containing both stamens and pistils.

Hesperidium.—A many-celled superior indehiscent fruit, pulpy within, and covered by a separable rind; as the Orange.

‡ *Heterocarpicus* (*fructus*). — An inferior fruit.

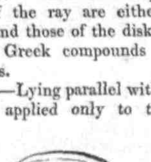
Heterocephalus.—Bearing in the same individual heads of entirely male flowers, and others entirely female.

‡ *Heteroideus.*—Diversified in form.

Heterogamous.—When in a capitulum the florets of the ray are either neuter or female, and those of the disk male.

Heteros.—In Greek compounds = variable, or various.

Heterotropal.—Lying parallel with the hilum. A term applied only to the embryo. (*ccvi.*)



CCVI.

Hexa.—In Greek compounds = six.

‡ *Hexalepidus.*—Consisting of six scales.

‡ *Hexapterus.*—Having six wings or membranous expansions.

Hexapyrenus.—Having six stones.

Hexapetaloid.—Consisting of six coloured parts, like petals.

‡ *Hexarinus.*—Having six stamens.

Hians.—Gaping; opening by a long narrow fissure cut across the shorter axis. (*ccvii.*)

CCVII.

Hibernaculum.—The poetical name of a bud or bulb.

Hibernalis.—Of or belonging to winter.

Hidden-veined.—Having the veins so buried in the parenchyma, that they are not visible upon external inspection.

Hilifer.—Bearing a hilum upon its surface.

Hilofera.—The second or internal integument of a seed.

Hilum.—The scar produced by the separation of a seed from its placenta; ‡ any point of attachment; also ‡ the apertures in the extine of pollen grains.

Hinoideus.—When veins proceed entirely from the midrib of a leaf, and are parallel and undivided; as in Ginger-worts, &c. When they are connected by little cross veins, the term is *Venuloso-hinoideus.*

Hippocrepiformis.—Horse-shoe shaped.

Hircinus, ‡ *Hircosus.*—Smelling like a goat.

Hirsuties, (adj. *Hirsutus, Hirtus*).—Hairiness; a covering caused by long, tolerably distinct hairs.

Hispid.—Covered with long stiff hairs.

Holosericeus.—Silky; so covered with hairs that it feels soft to the touch, although the naked eye may fail to detect the presence of hairs.

Homocarpous.—Having all the fruits of a flower-head exactly alike.

‡ *Homodromal.*—Having all the spires turned the same way; or the spires of a lateral organ the same as those on a central organ.

Homogamous.—When all the florets of a capitulum, &c. are hermaphrodite.

Homoios, or *Homo.*—In Greek compounds = alike or similar.

‡ *Homomallus.*—When organs originate all round an organ, but are turned to one side of it; the same as *Recurved.*

‡ *Homomorphus.*—Uniform. All shaped alike.

Homothalamus.—Resembling the thallus; a term employed among Lichens only.

Hooded.—See *Cucullatus.*

Hooked-back.—Curved in a direction from the apex to the base; as the side lobes of the leaf of the Dandelion (S B. 160.)

Homotropal.—Having the same direction as the seed, but not straight (*ccviii*).

CCVIII.

‡ *Horarius.*—Enduring for an hour or two only; as the petals of Cistus.

Hornus.—Anything the produce of the same year. *Rami horni* are branches not a year old.

Horny.—See *Corneus.*

Horologium Floræ.—A time-paper of flowers; a table explaining the time at which the same flowers expand in different latitudes.

Hortensis.—Of or belonging to a garden.

Hortus siccus.—Same as *Herbarium.*

Humifusus.—Spread over the surface of the ground.

Humilis.—Low. When the stature of a plant is not particularly small, but much smaller than that of kindred species. Thus, a tree twenty feet high may be low, if the other species of its genus are forty or fifty feet high.

‡ *Humor.*—Sap.

Hyalinus.—Transparent, or nearly so.

Hybernaculum.—See *Hibernaculum.*

Hybernalis.—Of or belonging to the winter.

Hybrids, Hybridæ.—Plants obtained by applying the pollen of one species to the stigma of another.

Hybriditas.—The being a hybrid.

Hyemalis.—Of or belonging to winter. Usually applied to plants that bloom in winter.

‡ *Hydrogera vasa.*—The spiral threads inside a spiral vessel; formerly supposed to be tubes conveying fluid.

Hygroscopicitas.—The property of extending or shrinking upon the application or removal of water.

‡ *Hylus, um.*—See *Hilum.*

Hymen.—In Greek compounds = a membrane, or membranous.

Hymenium.—That part of hymenomycetous Fungals on which the spores are borne; plates in an Agaric, tubes in a Boletus, &c. (V. K. 26.)

Hymenodes.—Having a membranous texture.

Hymenophorum. — The pileus of certain Fungals.

Hymenulum.—A disk or shield containing asci, but without excipulum.

Hyperboreus.—Inhabiting northern regions.

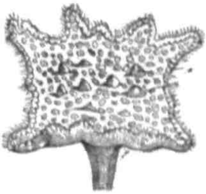
Hypha.—The filamentous, fleshy, watery thallus of certain fungoid plants.

Hypha, Hyphasma, **Hyphopodium.*—The mycelium, or stipe of certain Fungals.

Hypo.—In Greek compounds = under.

‡ *Hypoblastus.*—The flat dorsal cotyledon of a Grass.

Hypanthium, ‡ *Hypanthodium.*—A fleshy receptacle not inclosed in an involucre. (*ccix*).



CCIX.

Hypochilium.—The lower part of the lip of certain Orchids. (*ccx. a*).

CCX.

Hypocrateriform, ‡ *Hypocraterimorphus.*†—An organ, of which the tube is long and slender, and the limb flat. (*ccxi*).

CCXI.

Hypodermis.—The inner layer of the spore-case of an Urn-moss.

Hypogæus.—Growing under the earth.

Hypogynous.—Growing from below the base of the ovary.

‡ *Hypomenus.*—Free, not adherent, arising from below an organ without adhering to it.

Hypomiclia, Hypostroma, Hypothallus.—The mycelium of certain Fungals.

Hypophyllus.—Growing on the under side of a leaf.

‡ *Hypopodium.*—The stalk of the carpels.

‡ *Hypopteries.*—A wing growing from below anything, as the seed of a Fir-tree.

‡ *Hypopteratus.* Having a wing produced at the base or below.

‡ *Hypophyllium.*—A small abortive leaf, like a scale, placed below a cluster of leaf-like branches, or leaves. (*ccxii.*)

CCXII.

Hyposporangium.—The indusium of Ferns, when it grows from below the spore-cases. (*ccxiii.*)

CCXIII.

‡ *Hypostasis.*—The suspensor of an embryo.

‡ *Hyphostroma.*—The mycelium or spawn of Fungals.

Hypothallus.—Delicate filaments which constitute the vegetation of Coniomycetous Fungals. The inferior stratum of the thallus of Lichenals.

Hypothecium.—The cellular stratum below the thalamium of Lichenals.

Hysteranthius.—When leaves appear after flowers; as in the Almond.

Ianthinus.—Pure blue stained with red, so as to be intermediate between the two colours.

Icones.—Pictorial representations of plants.

Icos.—In Greek compounds = twenty.

Icosaëdral.—Having twenty sides, as the pollen of Tragopogon. (*ccxiv.*)

CCXIV.

Ides, or *Ideus.*—In terminating Greek compounds = similar: as *petaloideus*, like a petal.

‡ *Idiogynus.*—Not having a pistil.

Idiothalamus.—Having a different colour or texture from the thallus; a term used among Lichens.

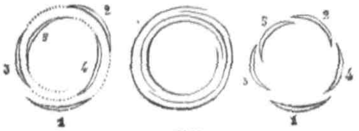
Igneus.—Very lively scarlet, fiery red.

Imberbis.—Having no hairs.

Imbricantia folia.—Leaves which overlap each other like tiles on a roof.

Imbricated. — When bodies overlap each other. Also same as *Imbricative.*

Imbricative.—Overlapping at the edge only; a term of æstivation. (*ccxv.*)



CCXV.

Immarginatus.—Having no rim or edge.

Immediatus.—Proceeding directly from a part, without the intervention of any other part; as the flower-stalks of a raceme.

Immobilis.—Immovable; that is to say, not having a free motion on the part which bears it; as many anthers.

Imparipinnatus.—When the petiole of a pinnate leaf is terminated by a single leaflet. (*ccxvi.*)

CCXVI.

Implexus.—Entangled, interlaced.

Impregnation.—The fertilization of the ovule by the pollen-tubes.

Impubera (ætas).—The period of maturity in fruit anterior to the fertilization of the ovules.

Inæqualis, ‡ *Inæquimagnus.*—Of unequal or dissimilar size.

Inæquilaterus.—When the two sides of a figure are not symmetrical; as the leaf of a Begonia.

Inæquinervius.—When the veins of a leaf are of unequal size.

Inanis.—Empty, not containing anything; or merely filled with a loose spongy substance.

‡ *Inantheratus.*—Bearing no anther; applied to sterile filaments or abortive stamens.

Inapertus.—Not opened, although its habit is to open.

Incanescens.—Having a hoary or gray aspect, because of the presence of hairs upon the surface.

Incanus.—See *Canus.*

Incarnatus.—See *Carneus.*

Inciso-serratus.—Having very deep slashed serratures.

Inciso-dentatus.—Having slashed toothings. (*ccxvii.*)

CCXVII.

Incisus.—Regularly divided by deep incisions.

Inclining.—Falling back considerably from the horizontal line.

Included.—Inclosed in anything.

Includentia folia.—Alternate leaves which, in their sleep, approach the buds in their axil as if to envelope them, as in Sida. (*De Candolle.*)

Incompletus.—Deficient in some of its parts, as a flower without corolla, or a calyx with only a part of its sepals.

Inconspicuus.—Small in size, not readily observed.

Incrassatus.—Thicker than usual in proportion to its area; as the leaves of the Houseleek.

‡ *Incrustatus.*—A term applied to seeds which grow so firmly to their pericarp as to appear to have but one integument. Also coated with earthy matter.

Incumbent.—Said of an embryo when its radicle is folded down upon the back of the cotyledons. (*ccxviii.*)

CCXVIII.

Incurvus, Incurvatus.—Curved inwards.

Indehiscent.—Not splitting in a definite manner when ripe.

Indigoticus.—The deepest blue.

Indirecte venosus.—When lateral veins are combined within the margin, and emit other little veins. (*Link.*)

Indivisus.—Not separated into other parts.

Indumentum.—The hairy covering of plants, of whatever kind.

Induplicate, Induplicative. — Having the margins bent abruptly inwards, and the external face of these edges applied to each other without any twisting. (*ccxix.*)

CCXIX.

Indurascens.—Hardening by degrees, as the permanent petioles of a Tragacanth bush.

Indusium, (adj. *Indusiatus.*)—The membranous cover that overlies or underlies the spore-cases of Ferns. ‡ The annulus of some Fungals.

Induviæ, (adj. *Induviatus*). — Withered leaves remaining upon a stem, and clothing it.

Inembryonatus.—Having no embryo.

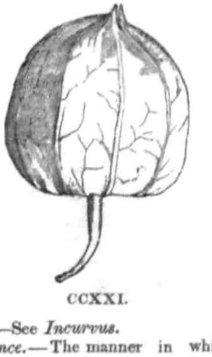
Inenchyma.—Fibro-cellular tissue; that is to say, cells having the appearance of spiral vessels. (*ccxx.*)

CCXX.

Inermis.—Destitute of any kind of spines or prickles.

Inferior.—Growing below some other organ; an inferior calyx grows below the ovary; an inferor ovary grows, or seems to grow, below a calyx.

Inflatus.—Thin, membranous, slightly transparent, swelling equally, as if inflated with air. (*ccxxi.*)



CCXXI.

Inflexed.—See *Incurvus.*

Inflorescence.—The manner in which the flowers are arranged.

Infossus.—Sunk in anything, as veins in some leaves, leaving a channel, however.

Infractus.—See *Incurvus.*

Infundibularis, Infundibuliformis. — See *Funnel-shaped.*

Infundibuli-campanulate.—Between funnel-shaped and campanulate. (*ccxxii.*)

CCXXII.

Innate.—Adhering to the apex of a thing, as the anther to the apex of a filament. (*ccxxiii.*)

CCXXIII.

Innovantes Gemmæ.—The fixed or persistent buds of Mosses.

Innovations.—Shoots which have not completed their growth; a term used in Bryology.

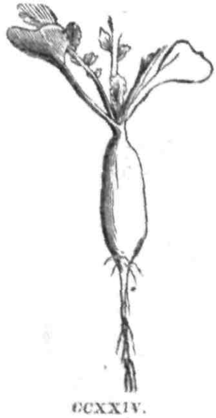
Inosculatio.—The operation of grafting or budding.

Insertion.—The manner in which one part is inserted into or adheres to, or originates from another.

‡ *Insertions, medullary.*—The medullary processes of Exogens.

Integer.—Properly speaking, this means having no kind of marginal or other division; but sometimes it has been used to indicate not pinnatifid, and also nearly destitute of marginal division.

Integra radix—A perfectly unbranched root, not bearing more than a few side fibres (*ccxxiv.*)



CCXXIV.

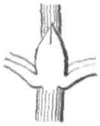
Integerrimus.—Perfectly free from division of the margin or other part.

Integra vagina.—A sheathing petiole which forms a continuous tube, not slit on one side, as in Sedges. (*ccxxv.*)

CCXXV.

Integumenta floralia.—The calyx and corolla.

Inter.—In composition = between; as *Interfoliaceus,* placed between leaves. (*ccxxvi.*)



CCXXVI.

Intercellular.—Anything interposed between the cells or tubes of tissue.

‡ *Intergerinum lignum.*—The dissepiment of a fruit.

‡ *Intermedius.*—Standing between two bodies in a different row, as petals when they alternate with sepals. Also half-way between one thing and another.

Internode.—The space which intervenes between two nodes.

Interrupted.—When any symmetrical arrangement is destroyed by local causes; a leaf is interruptedly pinnated when some of the pinnæ are much smaller than the others, or wholly wanting (EB. 120 b).

Intervenium.—The space of parenchyma between the veins.

Intortus.—Twisted upon itself. (*ccxxvii.*)

CCXXVII.

Intexine.—That coating of the pollen which is next the extine or outer crust, and above the intine or inner lining.

Intine.—The innermost lining of the shell of a pollen grain.

‡ *Intodiscalis.*—Inserted within the disk of a flower.

Intra.—Placed within anything; as *Intra-foliaceus*, placed within the axil of a leaf. (*ccxxviii.*)

CCXXVIII.

Intrarius.—Turned inwards; that is to say, towards the centre of a flower.

Intravalvularis.—Placed within valves, as the dissepiments of many Crucifers. (*ccxxix.*)

CCXXIX.

Intricatus.—See *Entangled.*

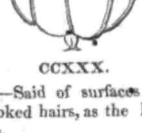
‡ *Introcurvus.*—See *Incurvus.*

Introflexus.—See *Incurvus.*

Introrsus.—Turned towards the axis to which it appertains; as an anther when its valves face the centre of a flower.

Introvenium.—Hidden-veined; when leaves are so much buried in parenchyma that they are not visible on external inspection.

Intrusus.—Pushed inwards; as when the base of a fruit is so concave as to seem as if pushed inwards by the peduncle. (*ccxxx.*)



CCXXX.

‡ *Inuncans.*—Said of surfaces covered with little hooked hairs, as the leaves of some Galiums.

Inundatus.—Flooded. Sometimes covered with water, sometimes dry.

Inus.—A termination expressing the quality of resemblance, as *Calycinus*, like a calyx in position, in colour, &c.; it also expresses augmentation, as *Calycinus*, having a large calyx.

Inverted.—Having the apex in an opposite direction to that of some other thing; as many seeds.

Invertentia folia.—Leaflets which in their sleep hang downwards, but touch by their upper surfaces.

Involucellum.—A diminutive of *Involucrum*; a secondary involucre, usually not containing more than one or two flowers.

‡ *Involucra lignea.*—The name given by Malpighi to the concentric zones of wood in Exogens.

Involucralis.—Of or belonging to an involucre.

Involucratus.—Having an involucre.

Involucre.—A ring or rings of bracts surrounding several flowers. (*ccxxxi.*)

CCXXXI.

‡ Also the peridium, volva, or annulus of some Fungals. (*ccxxxii.*)

CCXXXII.

Involute, Involutive.—When edges are rolled inwards on each side, as the leaf of the Apple. (*ccxxxiii.*)

CCXXXIII.

Involventia folia.—"Trifoliate leaves whose leaflets rise up, unite at the summit, and spread away in the middle so as to form an arch which shelters the flowers, as in Trifolium incarnatum." *DC.*

Irregular.—Having the parts which constitute one series of a flower dissimilar in size or form.

Isabella yellow.—Queen Isabella of Spain said that she would never change her shift till a certain town was taken; the siege lasted three years, and when Her Majesty removed her garment it had acquired a peculiar yellow, which has ever since borne her name.

Isidium.—A coral-like elevation of the thallus of a Lichen, bearing a globule at its end.

‡ *Isobrious, Isodynamous.*—Growing with equal force; two of the names of the dicotyledonous embryo.

‡ *Isogyrus.*—Forming a complete spire.

Isomerus.—Equal in number; an isomerous flower is one all whose parts are equal to each other in number.

Isos.—In Greek compounds = equal. Placed before the name of an organ, indicates that it is equal in number to that of some other which is understood: thus, *Isostemonous* is said of plants the stamens of which are equal in number to the petals.

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‡ *Jaspideus.*—"A mixture of many colours arranged in small spots." *Lecoq.*

Jeterus.—A yellowness of the green parts. Vegetable jaundice.

Jointed.—Falling in pieces at the joints, or separating readily there, or furnished with a distinct joint. (*ccxxxiv.*)

CCXXXIV.

Also applied to bodies having the appearance of being jointed, as the stem and leaves of Juncus articulatus.

‡ *Juba.*—A loose panicle, such as is often found in Grasses.

Juga.—The ridges on the fruit of Umbellifers (VK. 515).

Jugum.—A pair of leaflets: thus, *unijugus* is one pair; *bijugus* two pairs, &c.

Julus.—See *Amentum.*

‡ *Junctura.*—A joint or articulation; the place where a body spontaneously separates into two parts.

Juxta-position.—The manner in which organs are placed with respect to each other.

Keel, (adj. *Keeled*).—Formed in the manner of the keel of a boat; that is to say, with a sharp projecting ridge, arising from a flat or concave central plate, as the glumes of Grasses. Also see *Carina.*

Keramidium.—See *Cystocarp.*

Kermesinus.—See *Carmine.*

Kidney-shaped.—Resembling the figure of a kidney; that is to say, crescent-shaped, with the ends rounded, as the leaf of Asarum europæum (EB. 117 f).

Knee-jointed.—See *Geniculatus.*

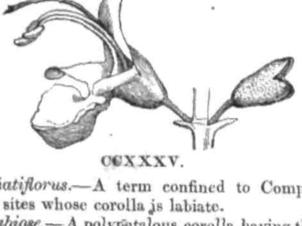
Kneepan-shaped.—Broad, round, thick; convex on the lower surface, concave on the other; the same as meniscoideus, but thicker. See *Patelliformis.*

Knob-like.—See *Gongylodes.*

Knotted.—Cylindrical, uneven on the surface, as the pod of Chelidonium (SB. 95).

Labellum.—The third petal of an Orchid, usually turned towards the lower front of the flower, and very different in form from the remainder. Also a similar petal in other flowers (VK. 120).

Labiate.—A term applied to a monopetalous calyx or corolla which is separated into two unequal divisions, the one anterior, and the other posterior, with respect to the axis. (*ccxxxv.*)



CCXXXV.

Labiatiflorus.—A term confined to Composites whose corolla is labiate.

‡ *Labiose.*—A polypetalous corolla having the appearance of being labiate.

Labium.—The lower lip of a labiate corolla.

‡ *Labyrinthiformis.*—Marked by sinuous intricate lines: same as *Dædaleus.*

Lac.—A fluid having an opaque appearance, and either white, orange, or some such colour, occurring in many plants.

Lacerus.—Irregularly divided by deep incisions.

Lacinia, (adj. *Laciniatus*).—A slash. A deep taper-pointed incision.

Lacinula.—A small lacinia or slash ; also the inflected point of the petals of Umbellifers. (*ccxxxvi.*)

CCXXXVI.

‡ *Lachrymæformis.*—Tear-shaped ; the same as pear-shaped, except that the sides of the inverted cone are not contracted ; as the seed of the Apple.

Lactescens.—Containing lac, or milk.

Lacteus.—Milk-white ; dull white verging to blue.

Lacuna, (adj. *Lacunose.*)—A large deep depression or excavation (VK. 33).

‡ *Lacunoso-rimosus.*—Marked by irregular cracks and excavations. (*ccxxxvii.*)

CCXXXVII.

‡ *Lacunoso-rugosus.*—Marked by deep broad irregular wrinkles, as the shell of the Walnut or stone of the Peach.

Lacustris.—Growing in lakes.

Lævigatus.—Having the appearance of being polished, as many seeds. (*ccxxxviii.*)

CCXXXVIII.

Lævis.—Free from asperities or hairs, or any sort of unevenness.

Lageniformis.—Shaped like a Florence flask. (*ccxxxix.*)

CCXXXIX.

Lagopus.—Hare-footed. A term applied to parts which are so closely covered with long hairs as to resemble a hare's foot; as the rhizome of some Ferns, and the inflorescence of some Grasses.

Lamella, (adj. *Lamellar*).—A plate or thin part such as is found at the end of many styles.

Lamellæ, Laminæ, Lamellulæ.—The gills of Fungals ; vertical, membranous, radiating, or branching plates belonging to a pileus.

Lamina.—The blade of a leaf ; that expanded part which terminates the petiole if there be one.

Lamina proligera.—A term among Lichens. "A distinct body containing the sporules, separating from the apothecia, often very convex and variable in form, and mostly dissolving into a gelatinous mass."—*Grev.* The waxy plate or disk occupying the centre of the apothecium. (*ccxl.*)

CCXL.

Laminating.—Separating into several plates or layers.

Lana, Lanugo, (adj. *Lanatus, Lanuginosus*).—Long, dense, curled, and matted hairs, resembling wool ; as in *Verbascum Thapsus.*

Lanceolate.—Narrowly elliptical, tapering to each end (EB. 117 m).

Lanceolate-hastate.—A hastate leaf whose principal lobe is lanceolate.

Lanceolate-sagittate.—A sagittate leaf, whose principal form is lanceolate. (*ccxli.*)

CCXLI.

Lapidosus.—Growing in stony or pebbly places.

Lappaceus.—Having the appearance of a *lappa* or bur ; that is to say, of a round body covered with small hooks.

Latera.—Sides ; the two opposite sides of a stem or similar body.

Lateral.—Fixed near or upon the side of any thing.

‡ *Laterinervius.*—Straight-veined, like the leaves of Grasses.

‡ *Lateristipulus.*—Having stipules growing on its sides.

Lateritius.—Red brick colour.

Latex.—The same as *Lac*, which see ; but extended to any kind of viscid fluid conveyed in laticiferous vessels, whether opaque or not.

Latex granules.—Particles of starch or other matter, floating in the latex.

Laticiferous vessels.—A continuous anastomosing tubular tissue in which latex is conveyed. It is probably a modification of cellular tissue, formed in a similar way to bothrenchyma (EB. 46, 47).

Lavender colour.—Pale blue, with a slight mixture of grey.

Laxus.—Said of parts which are distant from each other, with an open arrangement, such as the panicle among the kinds of inflorescence (EB. 140, 1).

Lead-coloured.—Slate-coloured, with a slight metallic lustre.

Leaf.—An expansion of the bark, placed symmetrically with regard to other leaves, and performing the offices of respiration and digestion when in its perfect condition; in an incomplete or modified state, constituting all the forms of the appendages of the axis. It is *simple* when not cut into separate parts, and *compound* when divided into other distinct parts.

Leaf-buds.—Buds from which leaves only are produced: they are called *normal* when produced at the axils, *adventitious* when they occur in places not axillary, and *latent* when they are undiscoverable by the naked eye.

Leaflet.—One of the divisions of a compound leaf.

Leaf-like.—See *Foliaceus.*

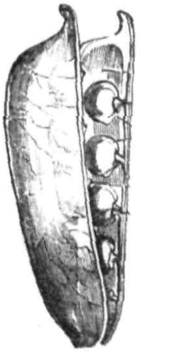
Leaf-stalk.—The (unexpanded) base of a leaf connecting it with the stem.

Leathery.—See *Coriaceus.*

Leather-yellow.—Whitish yellow.

‡ *Lecus.*—See *Corm.*

Legume.—The fruit of leguminous plants; a solitary two-valved carpel, bearing its seeds on the ventral suture only. (*ccxlii.*)



CCXLII.

Lemon-coloured.—The purest yellow, without any brightness; as in a Lemon when ripe.

Lenticellæ, (adj. *Lenticellatus*).—I glands. Rudimentary roots app the surface of the stems of man the form of small conical swelli

Lenticulæ. — The spore-cases of certain Fungals.

Lenticularis, Lentiformis.—Resembling a double convex lens.

Lentiginosus.—Covered with minute dots, as if dusted.

Lens-shaped.—See *Lenticularis.*

‡ *Lepals.*—Sterile stamens.

‡ *Lepicena.*—The glumes of Grasses.

Lepides, (adj. *Lepidotus*).—Scurfs; minute peltate scales, such as cover the foliage of Elæagnus.

Lepiota.—The annulus of certain Fungals.

‡ *Lepisma.*—A cup-shaped disk.

Lepra, (adj. *Leprous*).—A white mealy matter which exudes or protrudes from the surface of some plants; leprosy.

Leprosus.—Having a scurfy appearance.

Leptos.—In Greek compounds = slender, graceful; as *Leptophyllus,* slender-leaved.

Leptotichus.—Thin-sided; a term applied only to tissue.

Lettered.—See *Grammicus.*

Leuco.—In Greek compounds = white.

Lianes.—Woody twining or climbing plants.

Liber, (adj).—Free; as when there is no cohesion between parts in contact with each other.

Liber (subst.)—The inner lining of the bark of Exogens, where alone its woody matter resides.

Lichenologia.—That part of Botany which treats of Lichens

Ligula.—A strap. The radiant florets of certain Composites (*ccxliii*);

CCXLIII.

the membrane which occurs at the base of the lamina of a Grass-leaf; ‡ also certain appendages found on the coronet of some Asclepiads, alternating with the horns and spreading over the corolla (EB. 161, c).

‡ *Ligamentum.*—Same as Raphe.

Ligneus, Lignosus.—Having the texture of wood; of or belonging to wood.

Lignum.—The wood; that central part of a stem which lies below the bark, or its equivalent, the cortical integument.

Ligulatus. — Strap-shaped, narrow, moderately long, with the two margins parallel.

Liguliflorus.—Having a capitulum composed exclusively of ligulate florets.

Lilac.—Pale dull violet, mixed a little with white.

Limb.—The flat expanded part of a petal.

Limbatus.—Having one colour, surrounded by an edging of another.

‡ *Limes communis.*—The neck or collar of a plant. See *Collum.*

Line, (adj. *Linealis*).—The twelfth part of an inch.

Linea transversalis.—The ostiolum of certain Fungals.

Linear.—Narrow, short, with the two margins parallel; as the leaf of the Yew-tree.

‡ *Lineatipes.*—Having a lined or striated footstalk.

Lineatus.—Lined. Marked by fine parallel lines.

‡ *Lineata vasa.*—Vessels marked by transverse lines, such as the annular, scalariform, and other forms of the duct.

Lined.—See *Lineatus.*

Linguiformis.—Having the form of a tongue.

Liquor amnios.—The fluid that is contained in the sac within which the embryo is engendered.

Lirella.—A linear shield with a furrow along its middle, in such Lichens as Opegrapha. (*ccxliv.*)

CCXLIV.

Littoralis.—Growing on the sea shore.

‡ *Lituatus.*—Forked, with the points a little turned outwards.

‡ *Lituratus.*—When spots are formed by the abrasion of the surface.

Liver-coloured.—See *Hepaticus.*

Livid.—Clouded with greyish, brownish, and bluish.

Lobiolus.—The small lobes into which the thallus of some Lichens is divided.

Lobulatus.—Divided into small lobes.

Lobulus.—A small lobe.

Locelli, Loculi.—The peridia of certain Fungals.

Locellus.—A secondary cell; a small cell within a larger.

‡ *Loculatus, Locularis.*—Divided into cells.

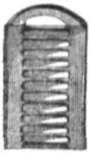
Loculus, ‡ *Loculamentum.*—A cell or cavity; usually the cell of a fruit or ovary; that is to say, the cavity of one or more carpels. Also the perithecium of certain Fungals.

Loculicidal.—That mode of dehiscence which consists in ripened carpels splitting or dehiscing through their backs. (*ccxlv., ccxlvi.*)

CCXLV.

CCXLVI.

Loculosus.—Divided by internal partitions into cells, as the pith of the Walnut-tree. This is never applied to fruits. (*ccxlvii.*)



CCXLVII.

Locusta.—A spikelet of Grasses; that is to say one of the collections of florets formed in such plants. (*ccxlviii.*)

CCXLVIII.

Lodiculæ.—The hypogynous scales of Grasses.

Lævis.—Level, neither rising into prominences nor sinking into channels, &c.

Longitudo.—In the direction of growth.

Loose.—See *Laxus.*

Loratus.—See *Ligulatus.*

Lomentum, (adj. *Lomentaceus.*)—An indehiscent legume, which separates spon-

taneously by a transverse articulation between each seed. (*ccxlix.*)

CCXLIX.

‡ *Lorica.*—The skin of a seed.
Lorulum.—The filamentary branched thallus of some Lichens.
Lucidus.—Shining.
Lumbricalis. — Worm-shaped; a term applied to the worm-like lobes of the frond of certain Sea-weeds.
Lunatus, Lunulatus(dim.)—Crescent-shaped.
Lupulinus.—Resembling a head of hops. (*ccl.*)

CCL.

Lupuline.—Waxy globules, resembling pollen, found on the bracts of the female flowers of the Hop
Lurid.—Dirty brown, a little clouded.
Luteofuscus.—Between yellow and fuscous.
‡ *Luteolus.*—See *Flavescens.*
Lutescens.—Yellowish. See *Flavescens.*
Luteus.—Such yellow as gamboge.
‡ *Luxuria, Luxuries.*—Rankness; an unnaturally exuberant growth.
Lycotropal.—An orthotropal ovule curved downwards like a horse-shoe. (*ccli.*)

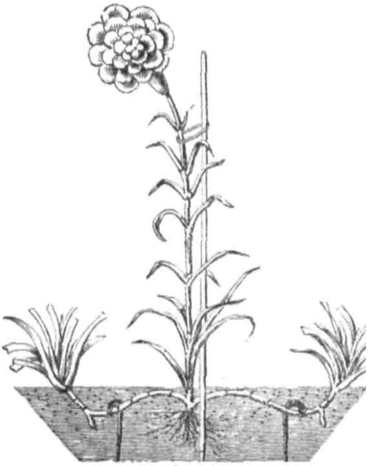
CCLI.

‡ *Lympha.*—Sap. The crude unelaborated fluid of vegetation.
‡ *Lymphæducts.*—Sap-vessels.
Lyrate, Lyreshaped, ‡ *Lyratipartitus,* ‡ *Lyratisectus.*—Pinnatifid, with the upper lobes much larger than the lower. (*cclii.*)

CCLII.

‡ *Lysis.*—The metamorphosis of a part.

Macranthus.—Long-flowered.
‡ *Macrocephalus.*—Big-headed. A term applied to dicotyledonous embryos whose cotyledons are consolidated.
‡ *Macropodal.* — Big-footed. A term applied by Richard to the embryo of Grasses whose cotyledon was mistaken by that author for a radicle.
Macros.—In Greek compounds = long; sometimes, large.
Macula, (adj. *Maculatus*).—Marked with broad irregular blotches.
Malacoid.—Having a mucilaginous texture.
Male system.—All that part of a flower which belongs to the stamens.
‡ *Malicorium.*—The rind of the Pomegranate.
Malleolus.—A layer; a shoot bent into the ground and half divided at the bend, whence it emits roots. (*ccliii*).



CCLIII.

Malpighiacei pili.—Hairs attached by the middle. (*ccliv.*)

CCLIV.

Mamilla.—The apex of the nucleus of an ovule.
Mammæformis, Mammillaris.—Teat-shaped. Conical, with a rounded apex. (*cclv.*)

CCLV.

Mancus.—Deficient in something; wanting.

Manicate.—Said of surfaces covered with hairs, so entangled that they can be stripped off like a skin.

Marcescens, Marcidus.—Not falling off until the part which bears it is perfected, but withering long before that time, as the flowers of Orobanche.

Marcor.—Welting, or flaccidity caused by loss of water.

Marginal.—Belonging to the margin or edge of anything.

Marginate.—Furnished with an edge of a different texture from the remainder of the body. (*cclvi.*)

CCLVI.

Margo thallodes.—The rim of the shield of a Lichen, formed by the thallus. (*cclvii.*)

CCLVII.

Marmoratus.—Marbled; traversed by irregular veins of colour, as a block of marble often is.

Masculus, inus.—Whatever belongs to the stamens.

‡ *Masked.*—See *Personate.* A body is also said to be masked when its true nature is concealed or disguised.

Massa seminalis.—The flesh of certain Fungals.

Massa sporophora, thecigera.—The spore-case of certain Fungals.

Masses.—Collections of anything in unusual quantity; as, for example, *pollen masses*, which are unusual collections of pollen.

‡ *Massulæ.*—The secondary masses of the sectile pollen-masses of some Orchids.

Matrix pollinis.—The cell in which pollen-grains are developed.

Matutinus.—Happening early in the morning.

Mealy.—See *Farinaceus.*

‡ *Meandriform.*—Having a bending or meandering direction; as the cells of the anther of Cucurbits. (*cxcviii.*)

Meatus intercellulares.—Passages between the cells or tubes of which plants consist.

Meatus pneumatici.—Air passages in the interior of plants.

Mediocris.—Intermediate between large and small.

Medulla, (adj. *Medullaris.*)—The pith; that central column of cellular matter over which the wood is formed in Exogens; ‡ any pith-like mass. The caro of certain Fungals.

‡ *Medulla seminis.*—The albumen of seeds.

Medullary rays.—The cellular plates or processes which connect the pith of Exogens with the bark, constituting the "silver grain" of their wood.

Medullary sheath.—A thin stratum of spiral vessels formed immediately over the pith.

Medullosus.—Having the texture of pith.

Megalos.—In Greek compounds = large.

Meiogyrus.—But little rolled inwards.

Meion.—Less; prefixed to the name of an organ, indicates that it is something less than some other organ understood.

Meiostemonous.—Is said of a plant the stamens of which are fewer in number than the petals.

Melanism.—A disease producing blackness.

Melas.—In Greek compounds = black without the mixture of any other colour.

Melleus.—Having the taste or smell of honey.

Melligo.—Honey-dew; a disease of plants in which an unnatural secretion of sweet matter appears on their surface.

Mellinus.—The colour of new honey.

‡ *Melonidium,* ‡ *Melonida.*—An inferior, fleshy, many-celled fruit; such as an Apple.

Melon-shaped, Meloniform.—Irregularly spherical, with projecting ribs; as the stem of Cactus Melocactus.

‡ *Membrana gongylifera.*—The hymenium of certain Fungals.

Membranous, Membranaceus.—Thin and semi-transparent, like a fine membrane; as the leaves of Mosses.

‡ *Membranula.*—The indusium of Ferns.

‡ *Memnonius.*—A brown black colour; pitch black.

Meniscatus.—A cylinder bent into half a circle. (*cclviii.*)

CCLVIII.

Meniscoid.—Thin, concavo-convex, and hemispherical, resembling a watch-glass.

Menstrualis, Menstruus.—Lasting for a month. *Bimestris* is said of things that exist for two months; *trimestris*, for three months, &c.

Mentum.—A projection in front of the flowers of some Orchids, caused by the extension of the foot of the column. (*cclix.*)

CCLIX.

Merenchyma. — Spherical cellular tissue (EB. 2).

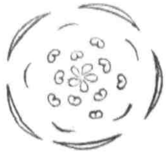
Mericarp.—One of the half fruits of an Umbellifer: it is a carpel ripened and separated from a common axis or growing point.

Meridianus.—Happening at noontide.

Merismatic.—Separating by the formation of internal partitions; cellular tissue is often thus multiplied.

‡ *Merithallus.*—An internode.

Meros.—In Greek compounds = the parts of a flower. Thus the annexed diagram is pentamerous, that is to say, is composed of parts arranged in fives. (*cclx.*)



CCLX.

Mesenterica. — The mycelium of certain Fungals.

Mesocarp.—That part of a pericarp which lies between the outer and inner skins or integuments.

‡ *Mesocauleorhiza.*—The line of demarcation between the ascending and descending systems in M. Gaudichaud's "Phyta."

Mesochilium.—The intermediate part of the lip of such Orchids as have it separated into three distinct portions.

‡ *Mesocolla.*—A supposed distinct intermediate layer of the cuticle, interposed between its upper and lower surfaces.

Mesodermis.—The middle layer of tissue in the shell of the spore-case of an Urn-moss.

Mesophlœum.—The cellular integument of bark, overlying the liber, and underlying the epiphlœum (EB. 84, c).

Mesophyllum.—All the interior parenchyma of a leaf, lying between the two skins.

‡ Also, in the language of Gaudichaud, the line of demarcation between the stalk and blade of a leaf.

‡ *Mesophytum.*—The line of demarcation between the internode and petiole.

‡ *Mesosperm.*—See *Sarcoderm.*

‡ *Microbasis.*—Same as *Carcerule.*

Micropyle.—The aperture in the skin of a seed which was once the foramen of the ovule. It indicates the position of the radicle.

Micros.—In Greek compounds = small.

‡ *Miliary Glands,*—are the stomates.

Milk vessels.—Those tubes which contain the milky fluids. See *Cinenchyma* and *Laticiferous vessels.*

‡ *Mill-sail-shaped.*—See *Molendinaceus.*

Miniatus.—Scarlet, with a decided mixture of yellow.

Mitriform.—Having the form of a mitre; that is to say, conical and not slit on one side; applied to the Calyptra of Urn mosses, in opposition to dimidiate. (*cclxi.*)

CXLI.

‡ *Mixtinervius.*—Having veins of various sizes forming a net-work, as in the Rose (SB. 11).

Modioliformis.—Shaped like the nave of a wheel, round, depressed, with a very narrow orifice; as the ripe fruit of Gaultheria.

Molendinaceus.—Furnished with large, perpendiclar, wing-like expansions. (*cclxii.*)

CCLXII.

Molybdos.—In Greek compounds = lead-coloured.

Moniliform.—Necklace-shaped, cylindrical, or terete, and contracted at regular intervals (EB. 73 d).

Mono.—In Greek compounds = one.

Monocarpicus, Monocarpous. — Producing fruit but once in its life, as an annual, or such perennials as the American Aloe, which always perishes after flowering.

Monochlamydeous.—Having but one floral envelope.

Monadelphous.—Having all the stamens united by their filaments into a tube. (*cclxiii.*)

CCLXIII.

‡ *Monoclinous.*—Having the two sexes in the same flower; hermaphrodite.

Monocotyledonous.—Having only one cotyledon, or if two are present, then having one much smaller than the other, and on a different level.

Monodichlamydeous.—Having indifferently either a calyx only, or both calyx and corolla.

Monœcious.—Having male and female organs in different flowers on the same plant. It is expressed by the signs ♂—♀.

Monogamia, (adj. *Monogamicus.*)—Having flowers distinct from each other, and not collected in a capitulum.

‡ *Monogenous.*—The same as *Endogenous.*

Monogynus.—Having but one style, even although many carpels be present.

Monoicus.—See *Monœcious.*

‡ *Monolepidus.*—Having but one scale.

Monopetalous.—Having all the petals united by their edges.

Monophyllous.—Having only one leaf; or several leaves united by their edges into one. (*cclxiv.*)

CCLXIV.

Monopterus.—Having one wing.

Monopyrenus.—Containing one stone.

Monosepalus.—Having the sepals all united into one body by their edges. (*cclxiv*).

Monstrositas.—Any unusual kind of development, or absence of development.

‡ *Moria.*—The parts of a flower in general; as *Pentamorius*, which signifies all the parts being arranged in fives.

Morphosis.—The manner of development; the order or mode in which organs form themselves from their earliest condition till their final state.

Monostichus.—Arranged in one row. (*cclxv.*)

CCLXV.

Morphus.—In Greek compounds = shape or appearance; as *Rhizomorphus*, having the appearance of a root.

Moschatus.—Having the smell of musk.

Mother cells.—Cells in which other cells are generated.

Morphology.—That part of Botany which treats of the transformations of organs.

Mucidus.—Musty; smelling of mouldiness.

Mucous, Mucosus.—Covered with a slimy secretion, or with a coat that is readily soluble in water, and becomes slimy.

Mucro, ‡ *Mucrona.*—A sharp terminal point.

Mucronate.—Abruptly terminated by a hard short point.

Mucronato-serratus.—Having the serratures terminated by a hard short point.

Mucus.—Gummy matter soluble in water.

Mules.—Plants obtained from the seeds of one plant fertilized by the pollen of some other species.

Mult, multus.—In Latin compounds = many.

Multiceps.—Having many crowns, as some roots.

Multifariam.—In many rows.

Multiferus.—Producing several times in one season.

Multifid.—Cut half way into many segments.

Multiflorus.—Bearing many flowers.

Multifoliatus.—Bearing many leaves.

Multijugus.—Bearing a very considerable number of pairs of leaflets.

Multiple.—Composed of several distinct parts.

Multiseptatus.—Divided by many stages into many chambers, as the pith of the Walnut. (*ccxlvii*).

Multiserialis.—In many rows.

Munientia folia.—Protecting leaves, which

overhang or otherwise guard parts requiring protection.

Muricated.—Furnished with numerous short hard excrescences. (*cclxvi.*)

CCLXVI.

Murinus.—Mouse-coloured; grey, with a touch of red.

‡ *Muscariform.*—Formed like a brush or broom; that is to say, furnished with long hairs towards one end of a slender body (*cclxvii.*) as the style and stigma of many Composites.

CCLXVII.

‡ *Muscarium.*—A collection of corymbose branches, such as are found in many Asters.

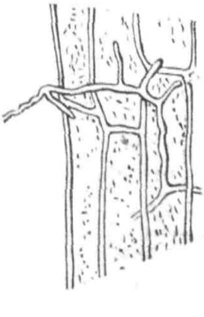
Muscology.—That part of Botany which treats of Mosses.

Mushroom-headed.—See *Fungiformis.*

Mutabilis.—Changeable in colour or in form.

Muticus.—Pointless. Employed only in contradistinction to some other term indicating being pointed: thus, if, in contrasting two things, one is said to be mucronate, the other, if it had not a mucro, would be called muticous; and the same term would be equally employed in contrast with cuspidate or aristate, or any such. It is also used absolutely.

Mycelium.—The spawn of Fungals; *i.e.*, the filamentous matter in which they all originate. (*cclxviii.*)



CCLXVIII.

Mycelitha.—The mycelium of certain Fungals in a stony bed, as in the *Pietra funghaia.*

Mycetologia.—That part of Botany which treats of Fungals.

Mycina.—Such a shield as occurs in the genus Bæomyces among Lichens. (*cclxix.*)

CCLXIX.

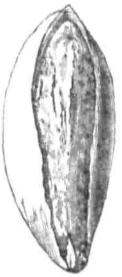
Nail.—Half-an-inch, or the length of the nail of the little finger.

Naked seeds.—Seeds having no pericarpial covering, as in Conifers and Cycads.

Napiformis.—Turnip-shaped; having the figure of a depressed sphere, as the root of the Turnip-radish.

Natans.—Floating *under* water; as *Confervas.*

‡ *Nauca.*—Seeds having a very large hilum, as that of the Horse-chesnut, Achras, &c. (*cclxx.*)



CCLXX.

‡ *Naucum.*—The fleshy part of a drupe.

Nave-shaped.—See *Modioliformis.*

Navicularis.—See *Cymbiformis.*

Nebulosus.—See *Clouded.*

Necklace-shaped.—See *Moniliformis.*

Necrosis.—Canker. A drying and dying of the branch of a tree, beginning with the bark and eating gradually inwards.

Nectar.—The honey of a flower; the superfluous saccharine matter remaining after the stamens and pistil have consumed all that they require.

Nectarifer.—Containing honey.

‡ *Nectarilyma.*—A collection of long hairs found on the inner surface of some flowers, as Menyanthes.

Nectarium.—A place or thing in which honey is secreted; ‡ also any supplementary or anomalous organ in a flower. The term has even been extended to mere discolorations.

‡ *Nectarostigma.*—A gland secreting honey in certain flowers, as the Ranunculus.

‡ *Nectarotheca.*—Literally a honey or nectar-case. The spur of certain flowers. See *Calcar.*

Needle-shaped.—Linear, rigid, tapering to a fine point from a narrow base, as the leaves of Juniper.

Nema.—In Greek compounds = the filament.

Nematodes.—Filamentous, thread-like; a term applied to Confervæ.

Nemorosus.—Growing in groves.

Nemathecium.—A case, resembling a spore-case, and containing numerous threads, in certain species of Sphærococcus.

Nephroideus.—Kidney-shaped, which see.

‡ *Nephrosta.*—The spore-case of the plants called Lycopods.

Nerved, Nervatus, Nerviger, Nervosus.—Having several ribs. (*cclxxi.*)

CCLXXI.

Nervation.—The manner in which veins are arranged.

Nerves, Nervures.—The ribs or principal veins of a leaf.

Netted.—Covered with reticulated lines which project a little. (*cclxxii.*)

CCLXXII.

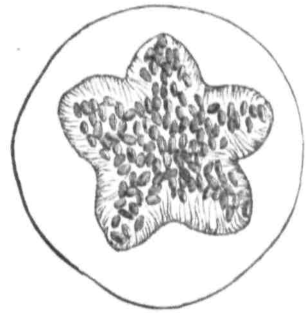
Any arrangement of veins which irregularly anastomose.

‡ *Nidosus, orosus.*—Having a disgusting smell between that of burnt meat and rotten eggs.

Nidulans, ‡ *Nidulatus.*—Nestling. Lying free in a cup-shaped or nest-like body; (*cclxxiii.*) as in the genus Nidularia, or the baskets of Marchantia.

CCLXXIII.

Also lying loose in pulp like the seeds of true berries. (*cclxxiv.*)



CCLXXIV.

Nidularium.—The mycelium of certain Fungals.

Niger.—Black. Black a little tinged with grey.

Nigredo.—Blackness.

Nigrescens, Nigricans.—Blackish.

Nigritus.—Blackened; as when a portion only is black—as the point of the glumes of a Carex.

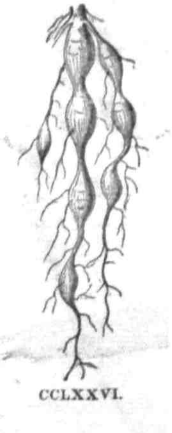
Nitidus.—Having a smooth, even, polished surface; as many seeds. (*cclxxv.*)

CCLXXV.

Nivalis.—Growing near snow, or appearing at a season when snow is on the ground.

Niveus.—Snow-white, the purest white.

Nodosus, Nodulose.—Knotted; an irregular form of necklace-shaped; chiefly applied to roots. (*cclxxvi.*)



CCLXXVI.

Node.—That part of a stem from which a leaf, whether complete or incomplete, arises; they are said to be ‡ *open* when the pith passes through them without interruption, and ‡ *closed* when the pith is interrupted in their vicinity. They are also said to be ‡ *single* when they bear no apparent buds, ‡ *compound* when their buds are manifest. If they do not surround the stem they are ‡ *divided*, if they do surround it they are ‡ *entire*.

Nodositas.—A knot; a woody swelling of any kind.

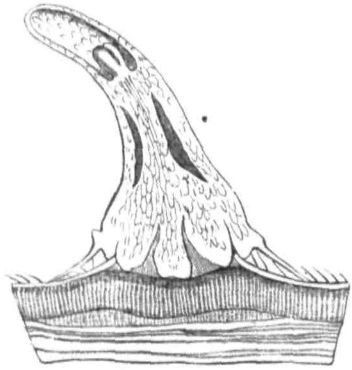
‡ *Nomologia.*—That part of Botany which relates to the laws which govern the variations of organs.

Noni.—Nine together.

Nonus.—The ninth.

Normal.—When the ordinary structure peculiar to the family or genus of a plant is in no wise departed from.

Nothus.—False or bastard; usually applied to the false roots formed by parasites when they attack living plants. (*cclxxvii.*)



CCLXXVII.

Noveni.—Nine.

‡ *Nucamentum.*—An amentum or catkin.

Nucamentaceus.—Having the hardness of a nut.

Nucleoli.—Smaller cytoblasts formed in the interior of a parent cytoblast.

Nucleus.—The centre part of the ovule in which the embryo is engendered. Also the cytoblast; or rather the circular space found on the sides of cells, and supposed to arise from its absorption. ‡ ‡ Any kind of kernel. The spores of Fungals.

Nucleus proligerus.—A distinct cartilaginous body coming out entire from the apothecia of some Lichens and containing the spores. (*Greville.*)

‡ *Nucula.*—A small hard seed-like fruit; also the same as *Glans;* also a small stone or seed; also the pistillidium of Charas.

‡ *Nuculanium.* — A pulpy, thin-skinned, superior fruit, having seeds lying loosely in the pulp; as a Grape.

Nudiusculus.—Nearly naked; having scarcely any hairs.

Nudus.—Naked; that is to say, either bald, from the total absence of hairs; or uncovered in consequence of the absence of any investing organs.

Nullinervis.—See *Enervis.*

Nut, Nux.—A hard indehiscent pericarp, usually containing only one seed; the same as *Glans*, and *Achænium.*

Nut, spurious.—A nut which owes its hardness to some other cause than the induration of the pericarp; as in Mirabilis.

Nutans.—Nodding; inclining very much from the perpendicular, so that the apex is directed downwards; as the flower of the Snowdrop.

Nux baccata. — A nut inclosed in a pulpy coveiing, formed by some external organ, as the Yew.

Ob.—This prefix signifies inversion; *ob*ovate is inversely ovate; *ob*cordate, inversely cordate; *ob*clavate, inversely club-shaped. It is sometimes used as a substitute for *sub*, somewhat: but improperly. (*cclxxviii.*)

CCLXXVIII.

Obcompressus.—Compressed, so that the two sutures of a fruit are brought into contact; flattened, back and front. (*cclxxix.*)

CCLXXIX.

‡ *Obcrenatus.*—A bad name for denticulate.

‡ *Obcurrens.*—Running together, and adhering at the point of contact.

‡ *Obimbricatus.*—Said ,of involucral scales, of which the interior become gradually the shortest. (*Leco.*)

‡ *Obliguliformis.*—Havińg a corolla, whose ligula proceeds from the inner edge instead of the outer, as in Zoegea. (*Leco.*)

Oblique.—Unequal-sided (EB. 177 e); also slanting.

Oblong.—Elliptical, obtuse at each end; as the leaf of the Hazel (EB. 117 g.)

‡ *Obovalis.*—Same as obovate.

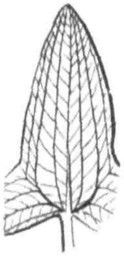
‡ *Obovoideus.* — Approaching the obovate form.

‡ *Obringens.*—Inversely ringent; that is to say, having the lower lip uppermost.

‡ *Obrotundus.*—Somewhat round.

‡ *Obsuturalis.*—Placed against the sutures of a pericarp; the same as septifragal.

Obtecto-venosus.—Having the principal and longitudinal veins held together by simple cross veins. (*cclxxx.*)



CCLXXX.

Obtegens.—Covering over anything.

Obtuse.—Blunt, or rounded; thus *obtusely crenated* is when crenatures are quite round, and not at all pointed; *obtusely cut*, when incisions are blunt. (*cclxxx*.*)

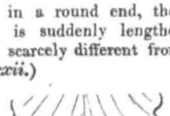
CCLXXX *.

Obtuse-angled.—When angles are rounded, as in the stem of Salvia pratensis. (*cclxxxi.*)

CCLXXXI.

Obtusiusculus.—Rather obtuse.

Obtusus cum acumine. — Terminating abruptly in a round end, the middle of which is suddenly lengthened into a point; scarcely different from cuspidate. (*cclxxxii.*)



CCLXXXII.

Obverse.—This has exactly the same meaning as *ob.*

Obverse-lunatus.—Inversely crescent-shaped; that is to say, with the horns of the crescent projecting forward instead of backwards. (*cclxxxiii.*)

CCLXXXIII.

Obvolute, Obvolutive.—When the margins of one organ alternately overlap those of an opposite organ. (*cclxxxiv.*)

CCLXXXIV.

Ocellated.—When a broad round spot of some colour has another spot of a different colour within it.

Ochraceus.—Ochre colour; yellow, imperceptibly changing to brown.

Ochrea. — A tubular membranous stipule through which the stem passes. It is formed by the consolidation of two opposite stipules (SB. 36).

Ochroleucus.—The same as *Ochraceus*, but much whiter.

Ochros.—In Greek compounds = pale yellow; thus *Ochroleucus* is pale yellow blended with white, yellowish white.

Octo.—Eight.

Octoni.—Growing eight together.

‡ *Oculus.*—An eye; *i. e.* a leaf-bud.

Odes.—A termination in Greek compounds = similar to; as *phyllodes*, like a leaf.

‡ *Œdema.*—A swelling; the so-called tumid glands found on the woody tissue of Conifers (EB. 39).

Offset.—A short lateral shoot, bearing clustered leaves at its extremity, and propagating a plant; as in Houseleek. (*cccxxxiv.*)

Often-bearing.—See *Multiferus.*

Oides, eus.—See *Odes.*

Oleaginous.—Fleshy in substance, but filled with oil.

Oleraceus.—An esculent; a plant fit for kitchen use; of the nature of a potherb. ‡ Also growing in cultivated places. *DC.*

Oligos. — In Greek compounds = a small number. It is generally used in contrast with many (*poly*), when no specific number is employed; as in the definition of things the number of which is small, but variable.

Olivaceus, Olive-green.—A mixture of green and brown.

Omphalodium.—The central part of the hilum, through which vessels pass into the raphe or chalaza.

One-sided.—Having all the parts turned one way, in consequence of a twist in their stalks.

Onomatologia.—That branch of knowledge which relates to the rules to be observed in the construction of names.

Oophoridium.—The spore-case of Lycopods. (*cclxxxv.*)

CCLXXXV.

Opaque.—The reverse of shining; dull. Not the reverse of transparent.

Operculum.—The lid of anything, as in the pitcher of Nepenthes (VK. 287) or the fruit of Lecythis; more especially the lid of the spore-case of Urn-mosses. (adj. *Operculate.*) (*cclxxxvi.*)

CCLXXXVI.

A deciduous lid, which closes up the foramina of some pollen grains.

‡ *Oplarium.*—The hollow funnel-like stalk which bears the shield of certain Lichens. See *Scyphus.*

Opposite.—Placed on opposite sides of some other body or thing and on the same plane. Thus, when leaves are opposite, they are on opposite sides of the stem; when petals are opposite, they are on opposite sides of the flower; and so on (SB. 13).

Opposite-pinnatus.—When the leaflets of a pinnate leaf are on the same plane at right angles with the common petiole.

Oppositifolius.—Opposite a leaf, that is to say, growing on the side of a stem opposite to that on which a leaf grows (SB. 176).

Opseospermata.—Tubercles on the surface of some Algals, containing spores.

‡ *Oræ radicum.*—The spongioles.

Orange colour.—The same as apricot colour, but redder; as in a ripe orange.

Orbilla.—Such a shield as is found in Lichens of the genus Usnea. (*cclxxxvii.*)

CCLXXXVII.

Orbicular.—Perfectly circular; as the leaf of Cotyledon orbiculare.

Orbiculus.—The fleshy ring formed by the stamens of Stapelia (EB. 161 a). The circular bodies found in the cup of a Nidularia (*cclxxiii*).

Organography.—The study of the structure of the organs of plants.

Organogenesis.—The gradual formation of an organ from its earliest appearance.

Orgya (adj. *Orgyalis.*)—Six feet, or the ordinary height of a man.

Orificium.—The ostiolum of certain Fungals.

‡ *Origoma.*—The cup of a Marchantia, containing its propagating bulbils.

Orthos.—In Greek compounds = straight.

Orthotropal.—A straight nucleus, having the same direction as the seed to which it belongs, the foramen being at the end most remote from the hilum. (*cclxxxviii.*)

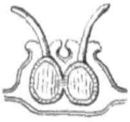
CCLXXXVIII.

Oscillating.—Adhering slightly by the middle, so that the two halves are nearly equally balanced, and swing freely backwards and forwards.

Osseus.—Bony. Hard, brittle, and very close in texture, not to be cut without difficulty; as the stone of a Peach.

‡ *Ossiculus.*—A drupe.

Ostiolum, os, osculum.—The orifice through which spores are discharged, as in the perithecium of such Fungals as Sphæria; (*cclxxxix.*)



CCLXXXIX.

an opening over the disk of the shield of certain Lichens.

Osus.—A termination indicating augmentation, as *Radiosus*, having a large root.

Outline.—The figure formed by the margin of a body.

Ovate.—Oblong or elliptical, broadest at the

CCXC.

lower end, so as to resemble the longitudinal section of an egg. (*ccxc.*)

Oval.—See *Ellipticus.*

Ovary.—That part of the pistil which contains the ovules.

‡ *Ovella.*—Young carpels.

Ovenchyma.—Oval cellular tissue (EB. 6).

Ovoidal.—A solid with an ovate figure, or resembling an egg. *DC.* (*ccxci.*)

CCXCI.

Ovule, ‡ *Ovum.*—The young seed.

Ovule-tube.—A thread-like extension of the apex of the nucleus, or of the sac of the amnios, rising up beyond the foramen.

Pachystichus.—Thick-sided; applied to cells only.

Pagina.—The surface of anything.

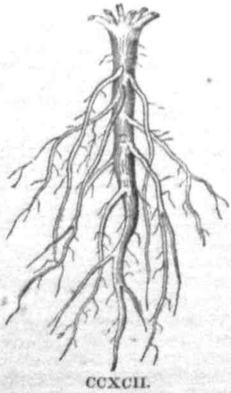
Painted.—When colours are disposed in streaks of unequal intensity.

Paired.—See *Conjugatus.*

‡ *Palaceous.*—Having a foot-stalk which adheres to the margin of a leaf, as is usually the case.

Palaris.—A root which is perfectly continuous with the stem.

Palari-ramosus.—A root which is palar, and produces numerous branches from its sides. (*ccxcii.*)



CCXCII.

Palate.—The prominent lower lip of a ringent corolla (SB. 183).

Paleæ (adj. *Paleaceous*). — Membranous scales resembling chaff. The inner scales of the flower in Grasses (SB. 235, 2).

Paleæformis.—Resembling a palea or chaff, as *Ramenta*, which see.

Paleaceous, ‡ *Paleoliferus.* — Covered with paleæ, as the receptacle of many Composites.

‡ *Paleolæ.*—The hypogynous scales of Grasses.

Palm (adj. *Palmaris*).—Three inches, or the breadth of the four fingers of the hand.

Palm-veined. — Having the principal vein radiating from a common point.

Palmate.—Having five lobes, the mid-ribs of which meet in a common point, so that the whole bears some resemblance to a human hand, as the leaf of the Maple. (SB. 23).

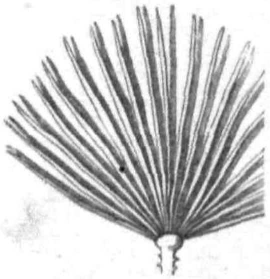
Palmatifid. — Cut half-way down in a palmate manner (SB. 23).

Palmatilobed.—Cut into shallow divisions in a palmate manner.

Palmatinervius, *Palminervis.*—See *Palm-veined.*

Palmatiparted, *Palmatisected.*—Cut nearly to the base in a palmate manner; a near approach to digitate.

Palmiformis, *Palmatiformis.*—When numerous ribs of a leaf are arranged as in the palmate form, radiating from the top of the petiole. (*ccxciii.*)



CCXCIII.

Paludosus, *Palustris.*—Growing in marshy places.

Panduratus, *Panduriformis.*—See *Fiddle-shaped.*

Panicle.—A branched raceme (EB. 140, 1).

Pannosus.—Having the texture of coarse cloth.

‡ *Pantachobryus.*—Growing in a circular manner.

Papery.—See *Chartaceus.*

Papilionaceous.—Having such a corolla as that of the Pea. (*ccxciv.*)

CCXCIV.

Papillæ.—Soft, oblong, superficial glands. Also the aciculæ of certain Fungals.

Papillosus, *Papilliferus.*—Covered with minute soft tubercles or excrescences.

Pappus.—The calyx of Composites, where

that organ is reduced to a membrane, or scales, or hairs, or a mere rim (VK. 476).

Pappiformis.—Resembling pappus.

Papulæ, (adj. *Papulosus*).—See *Papillæ*.

Papyraceus.—See *Chartaceus*.

‡ *Paracarpium.*—An abortive ovary.

‡ *Parabolical.*—Ovate, very obtuse, contracted below the point. (*ccxcv.*)

CCXCV.

‡ *Paracorolla.*—Any appendage of a corolla.

Parallelinervis, ‡ *Parallelivenosus.*—Having the lateral ribs of a leaf straight, as in Alnus glutinosa, (SB. 212). Also having the veins straight and almost parallel but united at the summit, as in Grasses.

Paranemata.—The paraphyses of Algals.

‡ *Parapetalum.*—Any appendage of a corolla consisting of several pieces.

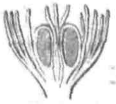
Paraphyses.—The jointed threads which accompany the organs of fructification in Urn-mosses and similar plants (VK. 34). The cystidia of Fungals, according to Leveillé.

‡ *Paraphyllia.*—Stipules.

Parasiticus.—Growing into some other plant, and deriving its food from its juices.

Parasiticus spurius.—See *Epiphytal*.

Paraspermatia.—Small reproductive bodies found in some Algals, and resembling spores. (*ccxcvi.*)

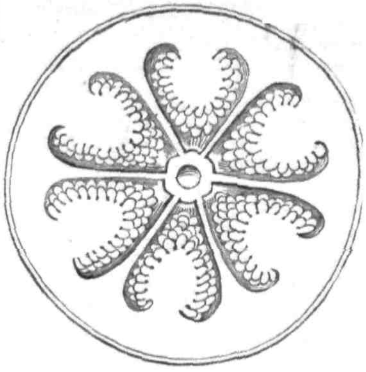


CCXCVI.

Parietal.—Growing to the walls or interior surface of an ovary. (*ccxcvii.*, *ccxcviii.*, *ccxcix.*)

CCXCVII.

CCXCVIII.



CCXCIX.

‡ *Parastades.*—The filiform rays of the coronet of a Passion-flower, and similar parts.

‡ *Parastamen*, *Parastemon.*—Any kind of abortive stamen.

‡ *Parastyli.*—Abortive styles.

Parenchyma, (adj. *Parenchymatosus.*)—Cellular tissue which has a spheroidal, not tubular form.

Parietes.—The inside walls of anything.

Paripinnatus.—See *Equally-pinnate*.

Parted, *Partitus.*—Divided into a determinate number of segments, which extend nearly to the base of the part to which they belong. Thus *bipartitus*, is parted in two; *tripartitus*, in three; and so on.

Partialis.—A secondary division; as in Umbellifers, where the umbels of the second degree bear this name.

Partibilis.—Capable of being divided, but not dividing spontaneously.

Partitioned.—Divided by internal horizontal partitions into chambers. See *ccxlvii.*

Partitions.—The deepest divisions into which a leaf can be cut without becoming compound.

Partitus.—Divided nearly to the base.

Pascuus.—Growing in pastures.

Patelliformis.—See *Kneepan-shaped*.

Patella, *Patellula.*—An orbicular sessile shield in Lichens, surrounded by a rim which is part of itself, and not derived from the thallus.

Patens.—Spreading wide open; as petals from the calyx. (*ccc.*)

CCC.

Patentissimus.—Spreading open so much a to fall back.

Pathology.—That part of Botany which relates to the diseases of plants.

Patulus.—Spreading half open.

Pear-shaped.—Obconical, with the sides a little contracted.

Pearl-grey.—Pure grey, a little verging to blue.

‡ *Pecten.*—See *Trichidium.*

Pectinatus. — The same as *Pinnatifid;* but the segments numerous, close, and narrow, like the teeth of a comb. (*ccci.*)

CCCI.

Pectinato-laciniatus. — Cut in a pectinate manner; that is to say, pectinate, with the lobes very long and taper-pointed.

Pedalis.—Twelve inches long, or the length of a tall man's foot.

Pedate, Pedatifidus.—The same as *Palmate,* except that the two lateral lobes are themselves divided into smaller segments, the midribs of which do not directly run into the same point as the rest. (*cccii.*)

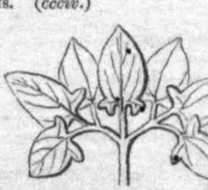
CCCII.

Pedatiformis.—Having a pedate form.

Pedatiloba, Pedatilobatus.—A palmate leaf, with the supplementary lobes at the base. (*ccciii.*)

CCCIII.

Pedatipartitus, Pedatisectus.—A pedate leaf whose segments are so many distinct leaflets. (*ccciv.*)



CCCIV.

Pedatinervis.—When the ribs are arranged in a pedate manner.

Pedicellus, Pediculus, Pedunculus, Pes, Petiolus.—The stipe of certain Fungals.

Pedicel, ‡ *Pediculus,* (adj. *Pedicellatus,* ‡ *Pediculatus.*)—A peduncle of a second or higher order, as in the raceme where the principal flower-stalk is the peduncle, and the lateral secondary ones are pedicels.

‡ *Pediculus antheræ.*—The filament.

‡ *Pedilis,* (adj. *Pedilatus*).—The neck of the fruit in many Composites.

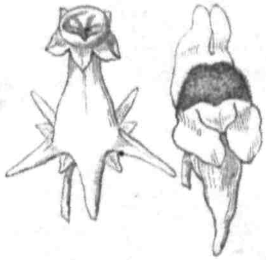
Peduncle, (adj. *Pedunculatus*).—The stalk of a flower.

Pedunculares cirrhi.—Tendrils proceeding from a peduncle.

Pelios.—In Greek compounds = livid.

‡ *Pellitus.*—Skinned; deprived of skin, or seeming so.

Peloria.—A return from habitual irregularity to regular form, as in the common Toad-flax. (*cccv.*)

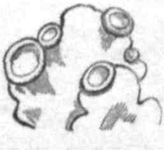


CCCV.

Peltate.—Fixed to the stalk by the centre, or by some point distinctly within the margin (EB. 117 e).

Pelta.—A target-like shield, found on the species of Peltidea. (*cccvi., cccvii.*)

CCCVI.



CCCVII.

Also a bract attached by its middle, as in Peppers.

Peltatifid.—A peltate leaf cut into subdivisions. (*cccviii.*)

CCCVIII.

‡ *Peltato-digitatus.*—A digitate leaf with the petiole much enlarged at the setting on of the leaflets.

‡ *Peltiformis.*—Having simple veins arranged as in a peltate leaf.

Peltinervis.—Having ribs arranged as in a peltate leaf.

‡ *Pelviformis.*—Like *cyathiformis*, but flatter.

‡ *Pendulinus.*—Having the habit of being pendulous. *DC.*

Penicillatus, Penicilliformis.—Resembling a camel's hair pencil; consisting of, or covered with, hairs which are nearly parallel with each. Sometimes, marked with colour as if laid on in streaks with a camel's hair pencil.

Pennatifid, &c.—See *Pinnatifid, &c.*

‡ *Penniformis.*—Having the ribs of a leaf arranged as in a pinnated leaf, but confluent at the point, as in the Date palm. *DC.*

Penninervis, Pennivenius.—Having ribs or principal veins running straight from the mid-rib to the margin at equal distances.

Penta.—In Greek compounds = five.

Pentacoccus. — Composed of five cocci, or shells, splitting with elasticity, and falling off a central axis or column. (*cccix.*)

CCCIX.

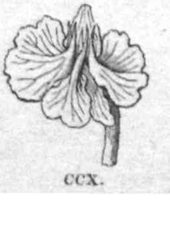
‡ *Pentakenium.*—The same as *Cremocarp*, excepting that it is formed of five fruits instead of two.

Pentapterus.—Having five wings.

Pepo, ‡ *Peponida,* ‡ *Peponium.*—A one-celled many-seeded inferior fruit with parietal placentæ and a pulpy interior, as a Gourd.

Per.—When prefixed to Latin terms increases their form, as *persimilis* which is = to very like.

‡ *Peraphyllum.*—A membranous expansion of the calyx formed after the fruit begins to ripen, or from the beginning. (*cccx.*)



CCX.

‡ *Perapetalum.*—The shaggy covering of such flowers as Menyanthes.

Perennial, Perennans, Perennis.—Lasting for several years, and yet flowering every year.

Perfect.—Complete in all the usual parts.

Perfoliate.—When the two basal lobes of an amplexicaul leaf are united together, so that the stem appears to pass through the substance of the leaf.

Pergameneus.—Having the texture of parchment.

Peri.—In Greek compounds = around, or placed on something surrounding some other part.

Perianth.—The calyx and corolla combined; that is to say, when they look so much alike that they cannot be readily distinguished, as in a Hyacinth.

‡ *Perianthianus.*—Proceeding from a perianth.

Pericarp.—The shell or rind of all fruits, taken as a whole; when it separates into layers, each layer may have a different name, but the whole is still the pericarp.

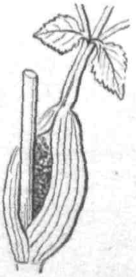
Pericarpialis, Pericarpicus.—Of, or belonging to, a pericarp.

‡ *Pericarpicus.*—Having the same direction as the pericarp.

Pericarpium. — The peridium of certain Fungals.

Perichætium, (adj. *Perichætial.*)—A collection of minute leaves surrounding the base of the seta of a Moss.

Pericladium.—The dilated sheathing base of some petioles, especially among Umbellifers. (*cccxi.*)



CCCXI.

Periclinium.—The involucre of Composites.

‡ *Periclinoides.*—A false involucre formed of paleæ of the receptacle in Composites, surrounding the sides of an elevated receptacle having florets at its summit, as in Evax.

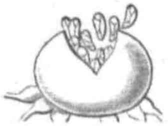
‡ *Pericolium.*—The perichætium of Mosses.

Periderma, Peridermis.—The outer cellular layer of bark, below the epidermis. See *Epiphlœum.* ‡ Also the epidermis of Algals.

Peridiolum.—A membrane by which the spores of some Algals are immediately

covered. *Fr.* Also the diminutive of *Peridium*, a secondary and interior peridium.

Peridium.—An external coat or skin covering over the parts of reproduction, as in Lycoperdon. Also a membranous dry receptacle, usually containing a large quantity of powder. *Leveillé.* (*cccxii.*)



CCCXII.

Peridium mitriforme.—The receptacle of certain Fungals.

‡ *Peridroma.*—The rachis of Fern leaves.

‡ *Perigonium.*—Usually the same as *Perianthium*; sometimes as *Perichætium.*

‡ *Perigynandra communis* or *exterior.*—The involucre of Composites.

‡ *Perigynandra interior.*—The corolla.

Perigynium.—The hypogynous setæ of Sedges; (*cccxiii.*)

CCCXIII.

the flask-like calyx in which the ovary of Carex is included (SB. 233, 2); also the hypogynous disk of other plants.

Perigynous.—Growing upon some part which surrounds the ovary, usually the calyx; but in the "Vegetable Kingdom" the corolla also is included within the meaning of the term.

Perinteger.—Perfectly entire, or undivided.

Periphericus.—Of or belonging to circumference.

Peripherico-terminalis.—Belonging to the circumference and apex of a body; a term applied to stems which grow both at the sides, augmenting their diameter, and at the end, increasing their length.

‡ *Periphoranthium.*—The involucre of Composites.

‡ *Periphyllia.*—The hypogynous scales of Grasses.

Peripterus, ‡ *Peripteratus.*—Surrounded by a wing like expansion.

Perisperm.—The same as *Albumen*; ‡ also the skin of a seed.

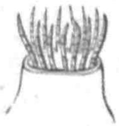
Perispermicus.—Furnished with albumen.

Perisporangium.—The indusium of Ferns when it surrounds the spore-cases or sori. Also the indusium itself.

‡ *Perisporium.*—The hypogynous setæ of Sedges. (*cccxiii.*) Also the skin of a spore.

‡ *Peristachyum.*—The glumes of Grasses.

Peristomium.—The fringe of teeth which surrounds the mouth of the spore-case of an Urn-moss. (*cccxiv.*)



CCCXIV.

Perithecium.—The part in which the asci of Lichens are immersed. Any case containing asci. Also a usually coriaceous or horny receptacle among Fungals, inclosing spores which are naked or contained in asci. (*cccxv.*)

CCCXV.

Peritropal.—Directed horizontally as regards the axis of a fruit.

Pernio.—A chilblain; a local affection caused by cold, and assuming the condition of an ulcer.

‡ *Perocidium.*—The perichætium of Mosses.

Peronate.—Laid thickly over with a woolly substance, becoming a sort of meal.

Persistent.—Not falling off, but remaining green until the part which bears it is wholly matured; as the leaves of Evergreen plants.

Personate.—A term applied to a monopetalous corolla, the limb of which is unequally divided; the upper division, or lip, being arched; the lower prominent, and pressed against it, so that, when compressed, the whole resembles the mouth of a gaping animal; as the corolla of Antirrhinum (SB. 182).

Pertusus.—Having slits or holes. (*cccxvi.*)

CCCXVI.

‡ *Perula.*—The covering of a leaf-bud formed

by scales. Also a projection in the flower of Orchids formed by the enlargement of two lateral sepals. See *Mentum*. Also the same as *Perithecium*.

Petals.—The divisions of the corolla, when they are not united to each other by their edges.

Petaline, *Petaloid*, *Petal-like.*—Having the colour and texture of a common petal.

Petiole, (adj. *Petiolatus.*)—The stalk of a leaf.

Petiolaris, *Petiolaceus.*—Inserted upon the petiole; as *Cirrhus petiolaris*, a tendril inserted on a petiole. (*cccxvii.*)

CCCXVII.

Petiolaneus.—Consisting of petiole only.

Petiolules, (adj. *Petiolulatus.*)—Petioles of a second degree; partial petioles, such as belong to the leaflets of compound leaves.

Petiolularis.—Of or belonging to a petiolule.

Petrosus.—Growing in stony places.

‡ *Phænocarpous.*— Bearing a fruit which has no adhesion with surrounding parts.

Phænogamous.—Having manifest flowers.

Phæo, *Phaios.*—Prefixed to Greek compounds = fuscous.

‡ *Phaeocyst.*—The name given by Decaisne to the cytoblast.

Phalanges.—Bundles of stamens; a collection of several stamens joined more or less by their filaments (EB. 169 k).

‡ *Phallus.*—The peridium of certain Fungals.

Phanerogamous.—See *Phænogamous.*

Phanes, *eros.*—In Greek compounds = manifest.

‡ *Phlœum.*—The cellular layer of bark below the epidermis.

Phœniceous.—Pure lively red, with a mixture of carmine and scarlet.

Phlebomorpha.—The mycelium of certain Fungals.

‡ *Phoranthium.* — The receptacle of Composites.

Phorus.—A termination in Greek compounds, signifying a stalk, or support; a part which bears some other parts.

Phragma.—A spurious dissepiment in fruits; *i.e.* one which is not formed by the sides of carpels. A partition of whatever kind.

Phragmiger, *Phragmifer.*—Divided by partitions.

Phthiriasis.—A disease produced by the presence of insects; lousiness.

Phycology.—That part of Botany which treats of Sea-weeds.

Phycoma.—The whole mass of an Algal; their thallus and reproductive bodies.

Phycomater.—The gelatine in which the sporules of Algals first vegetate.

‡ *Phycostemones.* — Hypogynous or other scales or glands belonging to the disk.

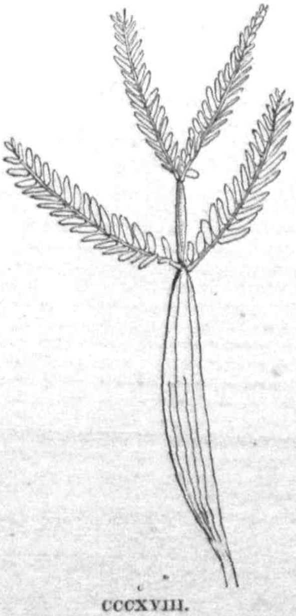
‡ *Phykenchyma.*—The elementary tissue of Algals.

‡ *Phykokyan.* — A blue colouring matter formed in Algals by fermentation. ‡ *Phykoerythrin.*—Their red colouring matter. ‡ *Phykohæmatin.*—A peculiar red principle found in one of them, viz. Rhytiphlœa tinctoria.

‡ *Phyllobryon.*—The contracted pedicel of an ovary, such as occurs in some Peppers.

Phyllodes, *Phyllodineus.*—Resembling a leaf, as the branches of Xylophylla (EB. 138).

Phyllodium.—That kind of leaf which results from an enlargement of the petiole and the loss of leaflets. Fig. *cccxviii.* represents the phyllodium in its transition state.



CCCXVIII.

Phylloideus.—See *Foliaceus.*

Phylloma.—The leaf-like thallus of Algals; as in Ulva.

Phyllomania.—The production of leaves in unusual numbers, or in unusual places.

‡ *Phyllophor.*—The upper herbaceous part of the stem of a Palm tree.

Phyllotaxis.—The manner in which leaves are distributed over a stem.

‡ *Phyllula.*—The scar left on a branch by the fall of a leaf.

‡ *Phyllum.*—A sepal. In Greek compounds a leaf.

‡ *Physeuma.*—The branch of a Chara.

Physiology.—That part of Botany which treats of the functions of plants.

‡ *Phytochlore.* — Green colouring matter. *Chlorophyll.*

‡ *Phytoerosia.*—That part of Botany which relates to the diseases of plants.

Phytogelin.—The gelatinous matter of Algals.

Phytography.—That part of Botany which teaches the art of describing plants.

Phytoliths.—Fossil plants.

Phytology.—That part of Botany which treats of plants in general.

Phyton.—A rudimentary plant, out of numbers of which perfect plants are made up, according to *Gaudichaud.*

‡ *Phytopolitus.*—Any parasitical plant, whether real or apparent.

Phytos.—In Greek compounds = a plant.

Phytotomy.—That part of Botany which teaches anatomical structure.

Piceus.—Black, changing to brown.

Pictus.—See *Painted.*

‡ *Pilaris.*—Composed of small hairs.

Pileatus, Pileiformis.—Having the form of a cap; or having a pileus.

Pileolus.—A little cap or cap-like body; also the diminutive of Pileus.

Pileorhiza.—The cap of a root: a membranous hood found at the end of the roots of Nuphar and other plants, and distinct from the spongiole.

Pileolus.—The receptacle of certain Fungals.

Pileus.—A convex expansion terminating the stipes of Agaricaceous Fungals, and bearing the hymenium (SB. 250, 1).

Pili.—Hairs.

Pilidium.—An orbicular hemispherical shield in Lichens, the outside of which changes to powder; as in Calycium. (*cccxix.*)

CCCXIX.

Piliferus.—See *Hair-pointed.*

Pilose.—Covered with hairs; covered with somewhat erect, loose, distant hairs; having the form of hairs.

Pilosity.—Hairiness.

Pilosiusculus.—Somewhat hairy.

Pilula.—‡ A cone like a Galbulus. Any spherical inflorescence. (*cccxx.*)

CCCXX.

Pimpled.—See *Papillosus.*

Pinnæ.—The primary divisions of a pinnated leaf; its leaflets.

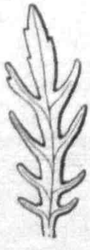
Pinnate.—When simple leaflets are arranged on each side a common petiole (EB. 120 f).

Pinnate with an odd one.—See *Imparipinnatus.*

Pinnatifid, Pinnatiscissus.—Divided almost to the axis into lateral segments, something in the way of the side divisions of a feather. (*cccxxi.*)

CCCXXI.

Pinnatifido-incisus.— Pinnatifid with very deep segments. (*cccxxii.*)



CCCXXII.

Pinnatifido-laciniatus.—Pinnatifid, with the segments laciniated.

Pinnatilobus, Pinnatilobatus.—When the lobes of a pinnatifid leaf are divided to an uncertain depth.

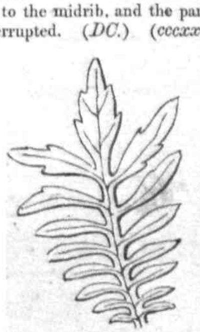
Pinnatifido-sinuatus.—Pinnatifid with the segments sinuated. (*cccxxiii.*)

CCCXXIII.

Pinnatipartitus.—Having the nervures pinnated, the lobes separated beyond the middle, and the parenchyma uninterrupted; as in Polypodium aureum. (*DC*). (*cccxxiv.*)

CCCXXIV.

Pinnatisectus.—When the lobes are divided down to the midrib, and the parenchyma is interrupted. (*DC.*) (*cccxxv.*)



CCCXXV.

Pinnulæ.—The secondary divisions of a pinnate leaf.

Piperitus.—Having a hot biting taste.

Pisiformis.—Pea-shaped.

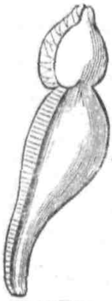
Pistillary cord.—A channel which passes from the stigma through the style into the ovary.

Pistil.—The female part of a flower, consisting of ovary, style, stigma, and ovules.

Pistillidia.—Young spore-cases; organs in the Muscal alliance, which have the appearance of pistils (VK. 34, 1).

Pistilligerus.—Bearing a pistil.

Pitcher.—A hollowed-out leaf, furnished with a distinct extremity or lid; the latter being the lamina, the former the petiole. (*cccxxvi.*)



CCCXXVI.

Pitcher-shaped.—The same as Campanulate, but more contracted at the orifice, with an erect limb; as the corolla of Vaccinium Myrtillus.

Pith.—See *Medulla.*

Pits.—Depressions on the inside of cells or tubes, formerly taken for pores, which they resemble.

Pitted.—Having numerous small shallow depressions or excavations. (*cccxxvii.*)

CCCXXVII.

Placenta.—The place or part on which ovules originate. ‡ Also applied to the hymenium or even spore-case of Fungals.

Placenta-shaped.—Thick, round, and concave on both the upper and lower surface; as the root of Cyclamen.

‡ *Placentary.*—A placenta which is long and narrow, and bears many ovules.

Placentatio.—The manner in which the placenta is constructed or placed.

Plaited.—Folded lengthwise, like the plaits of a closed fan; as the Vine-leaf and many Palm-leaves.

Plane.—Flat; perfectly level or flat; as many leaves.

Planiusculus.—Nearly flat.

‡ *Plantulatio.*—Germination.

Platys.—In Greek compounds = Broad.

‡ *Plecolepis.*—An involucre of Composites, i which the bracts are united into a cup.

Pleios.—In Greek compounds = more tha one, several.

Pleistos.—In Greek compounds = most, great many.

‡ *Pleiophyllous.*—A name given to such nodes as have no manifest buds.

Plenus.—Double, as in double flowers.

Pleurenchyma.—The woody tissue, consisting of tough slender tubes, out of which the woody parts are mainly formed (EB. 26).

‡ *Pleurodiscus.*—Growing on the sides of the disk.

Pleurogyratus.—A term employed for those Ferns whose spore-case has a ring carried round the sides (VK. 59).

‡ *Plexeoblastus.*—An embryo whose cotyledons are not developed in the form of true leaves, although they rise above the earth and become green.

Plica.—An excessive multiplication of small twigs, instead of branches.

Plicæ.—The lamellæ of certain Fungals.

Plicatilis.—Capable of being plaited.

Plicatus, Plicativus. — Plaited lengthwise like a lady's fan. *Plicatus* is usually employed in speaking of *æstivation*. (*cccxxviii.*)

CCCXXVIII.

‡ *Plopocarpium.*—The same as *Follicle.*

Plumbeus.—Lead-coloured.

Plumose.—See *Feathery.*

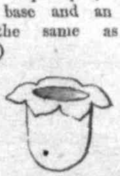
Plumule.—The bud of a seed. The youngest bud in a plant; placed between the cotyledons if the plant has more than one, or on one side of a solitary cotyledon (SB. 77).

Pluri.—In composition = more than one; thus *Pluriloculares* signifies containing more than one cell; *Pluriceps* having more than one head, as the crown of many roots.

‡ *Pneumato-chymifera (vasa).*—Spiral vessels.

‡ *Pneumatophorum (vasum).*—The membranous tube of a spiral vessel, within which the spiral fibre is twisted.

Poculiform. — Cup-shaped, with a hemispherical base and an upright limb; nearly the same as Campanulate. (*cccxxix.*)



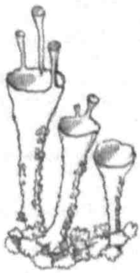
CCCXXIX.

‡ *Podicillum.*—A very short podetium.

Podium, Podus.—A stalk, or receptacle, or torus; only used in Greek compounds.

Podogynium, (adj. ‡ *Podogynicus*, ‡ *Podogynus*).—An elevation in the centre of a flower, on the summit of which the ovary stands; it is in reality an internode (VK. 327).

Podetia, ‡ *Podeta.*—The stalk-like elevations of the thallus of some Lichens, on which the shields are supported. (*cccxxx.*)



CCCXXX.

Also the stalk that bears the spore-cases of Urn-mosses, and the receptacle of such plants as Marchantia.

Podospermium.—The cord by which some seeds are connected with their placenta. See *Funiculus.*

Pogon.—A beard. In Greek compounds = any collection of long hairs.

Pointletted.—See *Apiculatus.*

‡ *Polakenium.*—The same as *Pentakenium.*

‡ *Polexostylus.*—See *Carcerulus.*

Politus.—Having the appearance of a polished substance; as the testa of many seeds. See *Lævigatus.*

‡ *Pollachigenus.*—Bearing fruits many times during its existence.

Pollen.—The powdery or other matter usually contained in the cells of an anther, by whose action on the stigma the fertilisation of the ovules is accomplished (EB. 173.)

Pollen cells.—The cavities of an anther, in which the pollen is formed.

Pollen grain or *granule.*—Each particle of pollen.

Pollen tube.—A membranous tube emitted by pollen, and conducting the fluid which the pollen secretes, down the style (EB. 192).

Pollex, (adj. *Pollicaris*).—The first joint of the thumb; an inch.

Pollinaria.—The supposed anthers of the Muscal alliance. See *Antheridia.*

‡ *Pollinarium.*—The collection of stamens in a flower; the same as *Andrœceum.*

‡ *Pollinarius.*—Covered with pollen.

Poly.—In Greek compounds = numerous.

Polyadelphus.—Having many parcels of stamens (EB. 169 k).

Polycarpous.—‡ Having the power of bearing fruit many times without perishing. Also, and more properly, bearing many distinct fruits or carpels in each flower. This is also called *Polycarpicus* (SB. 61).

Polycephali pili.—Hairs divided at the end into several arms (EB. 73).

‡ *Polychorion*, ‡ *Polychorionides.*—A polycarpous fruit like that of Ranunculus. See *Etærio.*

Polycladia.—The same as *Plica.*

Polycotyledoneus.—Having more cotyledons than two.

‡ *Polyflorus.*—A barbarism for multiflorous.

Polygamus. — Having, on the same plant, some flowers male, others female, and others hermaphrodite. Its sign is ♂-⚥-♀.

Polygynia.—Having many distinct styles.

‡ *Polygyrus.*—Consisting of several circles or whorls.

‡ *Polylepidus.*—Having many scales.

Polymerus.—Consisting of many parts.

Polypetalus.—Having the petals perfectly distinct from each other.

‡ *Polyphore.*—A receptacle which bears many distinct carpels, as in Crowfoots.

Polysarcia.—An excess of sap, giving rise to unnatural growth, &c.

‡ *Polysecus.*—A fruit consisting of many distinct carpels, as in Ranunculus. See *Etærio.*

Polysporus.—Containing a great many spores.

‡ *Polystemonous.* — Having a much larger number of stamens than petals.

‡ *Polytomous.*—Pinnate, but without having the divisions articulated with the common petiole.

Pome.—An inferior, fleshy, many-celled fruit, like that of the Apple.

Pomeridianus.—Occurring in the afternoon.

Pori, (adj. *Porosus*).—Apertures in the covering of anything; as in the anthers for the emission of pollen (hence *porandrous*) (EB. 172 c), or in the skin, when they are also called stomates. Also, appendages of the pileus among Fungals in the form of cylindrical or angular tubes, placed side by side, open at one end, and containing in their cavity the organs of reproduction.

Porphyreus.—Brown, mixed with red. A warm red.

Posticus.—Turned away from the axis of a flower, as some anthers whose dehiscence takes place next the petals. Also, stationed on that side of a flower which is next the axis.

Pouch-shaped.—Hollow, and resembling a little double bag, as the spur of many Orchids. (*cccxxxi.*)

CCCXXXI.

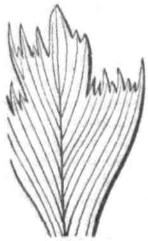
Powdery.—Covered with a fine bloom or powdery matter, as the leaves of Primula farinosa.

Præcox.—Appearing early in the year, or earlier than others related to it.

Præfloration —The arrangement of the parts of the flower when unexpanded. See *Æstivation.*

Præfoliation.—The arrangement of leaves in a leaf-bud.

Præmorse.—The same as truncate, except that the termination is ragged and irregular, as if bitten off. (*cccxxxii.*)



CCCXXXII.

Præustus.—Looking as if burnt, owing to the formation of a brown matter in the interior.

Prasinus.—Grass-green.

Pratensis.—Growing in meadows.

‡ *Precatorius contextus.*—Tissue-shaped, like a necklace or rosary. See *Moniliform.*

‡ *Precius.*—See *Præcox.*

Prickles.—Hard, conical, sharp elevations of the epidermis or epiphlœum.

Prickly.—Furnished with prickles, as the stem of a Rose.

Primarius.—The first part developed ; or the principal division of any organ.

Primine.—The exterior integument of the ovule.

‡ *Primigenius, Primordial.* — The earliest part developed in a plant. Primordial leaves are the first leaves produced by the plumule.

Primordial utricle.—The first layer of protoplasm thrown down over the interior of a cell.

Prismaticus.—Prism-shaped. Having several longitudinal angles and intermediate flat faces, as the calyx of Frankenia pulverulenta. (*cccxxxiii.*)

CCCXXXIII.

Prismenchyma.—Prismatical cellular tissue.

Proboscideus.—Having a hard terminal horn, as the fruit of Martynia.

Procerus.—Very tall.

Processus.—Any extension of the surface.

Processus hymenii.—The aciculæ of certain Fungals.

Procumbent.—Lying flat upon the ground.

‡ *Productum.*—The same as Calcar, which see.

Proembryo.—The reproductive part of a spore. The youngest thallus of a Lichen.

Protuberantia elongata.—The aciculæ of certain Fungals.

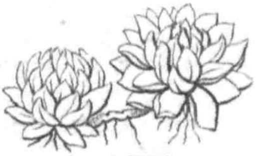
‡ *Proles.*—The species. That collection of similar individuals which is so called.

Proliferatio.—The production of one organ by a very different one, as that of cup-like appendages by leaves, of branches by flowers.

Proligerus.—See *Lamina proligera.*

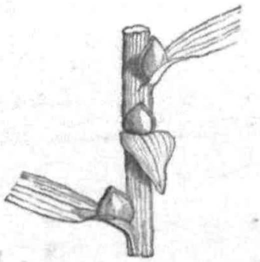
Pronus.—Lying flat upon the earth, or any other thing.

‡ *Propaculum, Propagulum.*—A runner or slender branch proceeding from the surface of the ground, ending in an expanded leaf-bud, and capable of propagation, as in the House-leek. See *Offset.* (*cccxxxiv.*)



CCCXXXIV.

Propagines.—Deciduous axillary bulbs formed on the stem of some plants. (*cccxxxv.*)



CCCXXXV.

Propago.—The branch that is bent down in the operation of layering.

Propagula.—The powder-like grains which constitute the soredia of Lichens.

Prophyses, Prosphyses.—The abortive pistillidia of the Muscal alliance.

‡ *Proscolla.*—A viscid gland on the upper side of the stigma of Orchids, to which the pollen masses become attached.

Prosenchyma.—Short cellular tissue, having acute extremities.

‡ *Prostypus.*—The raphe.

Proteranthous.—Having leaves which appear before the flowers.

Protophytology.—That part of Botany which treats of fossil plants.

Protophyllum.—The first leaf of a cryptogamic plant after germination.

Protoplasma.—The matter which is deposited over the inside walls of a cell subsequently to the formation of the cell itself.

Protostrophes.—Spirals of a second degree in the development of leaves.

Protothallus.—The first part formed by Lichens after germination is over.

‡ *Proxylar.*—Capable of forming wood.

‡ *Proxyle.*—Newly-formed wood.

Pruina, (adj. *Pruinosus*).—A coarse granular secretion found on the surface of some plants.

Pruina seminalis.—The spores of certain Fungals.

‡ *Prunus.*—A drupe.

Pruriens.—Causing an itching sensation.

Pseudo.—In Greek compounds = spurious.

Pseudo-bulb.—A part having the appearance of a bulb, but not its structure. The thickened above-ground stem of many Orchids. (*cccxxxvi.*)

CCCXXXVI.

Pseudo-costatus.—Having the curved and external veins, both or either, in a reticulated leaf, confluent into a line parallel with the margin, as in many Myrtle-blooms. (*cccxxxvii.*)

CCCXXXVII.

Pseudo-cotyledon.—See *Proembryo.*

Pseudo-gyratus.—Falsely ringed; when an elastic ring is confined to the vertex of the spore-cases of Ferns (VK. 60).

Pseudo-hymenium.—A covering of sporidia resembling the hymenium of Fungals.

Pseudo-monocotyledonous.—Having two or more cotyledons consolidated into a single mass, as in the Horse-chesnut.

Pseudo-parasiticæ.—False parasites, including those plants which only attack dead tissues, as many Fungi, or *Epiphytes*, which see.

Pseudo-peridium, Pseudo-perithecium.—A covering of sporidia, resembling the peridium. (*cccxxxviii.*)

CCCXXXVIII.

Pseudo-pyrenium.—The perithecium of certain Fungals.

‡ *Pseudo-stereus.*—Partially grown together, as the bulb-scales of the Crown Imperial.

Pseudo-stroma.—The receptacle or perithecium of certain Fungals.

‡ *Pseudo-thallus.*—The axis of such very simple forms of inflorescence as a glomerulus, or simple cyme, or umbel.

Psilos.—In Greek compounds = thin.

Pteris.—In Greek compounds = a wing or membranous expansion.

Pteridographia.—That part of Botany which treats of Ferns.

‡ *Pteridium.*—A kind of fruit, having a wing at one end, or at the back. See *Samara.*

‡ *Pterygium.*—Any wing or membranous expansion of seeds (VK. 455, 3).

‡ *Ptychode.*—An internal membrane overlying the exterior skin of a cell internally. The protoplasma.

Pubes, (adj. *Pubescens, Pubens.*)—See *Downy.*

Pubera, (*aetas.*)—The period in a fruit succeeding to the fertilisation of the ovules.

Pulley-shaped.—Circular, compressed, contracted in the middle of its circumference so as to resemble a pulley, as the embryo of Commelina communis. (*cccxxxix.*)

CCCXXXIX.

Pullus.—Black, with a strong lustre.

Pulpa.—The juicy tissue found in the interior of plants. Sometimes applied to the succulent hymenium of Fungals.

Pulvereus.—Powdery; consisting of powdery matter.

Pulverulentus.—Covered with dust or powdery matter.

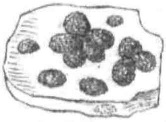
Pulvillum.—A hot-bed.

Pulvinuli.—Spongy excrescences in Lichens, sometimes rising up from the thallus and often resembling minute trees, as in Parmelia glomulifera.

Pulvinus, (adj. *Pulvinatus,* ‡ *Pulviniformis*).—A cushion-like enlargement at the base of some leaves, or at the apex of some petioles.

Pulvis.—Powder, dust, &c.

Pulvinulus.—A heap of naked spores, such as occur in the genus Spiloma. (*cccxl*).



CCCXL.

‡ *Pulvisculus.*—The powdery matter found in the spore-cases of Lycopods.

Pumilus.—Short, close-growing, as compared with other species of the same genus or family.

Punctata vasa.—Dotted vessels; tubes having dot-like appearances on their sides. See *Bothrenchyna* (EB 23).

Punctatus.—Dotted. Marked with some colour disposed in very small round spots or points.

‡ *Punctiflorus.*—Having dotted flowers.

Punctum vegetationis.—The growing point of a leaf-bud.

Pungent.—Terminating gradually in a hard sharp point, as the lobes of the Holly-leaf.

Puniceus.—See *Phoeniceus.*

Purple.—Dull red with a slight dash of blue.

Purpurascens.—Having a purplish colour.

Pus, Podus.—In Greek compounds = foot or stalk.

Pusillus.—Very small. See *Perpusillus.*

Putamen.—The hardy bony lining or stone of the fruit of many plants, as of the Plum, Cherry, &c.

‡ *Putaminaceus.*—Having the texture of putamen.

Pycnos.—In Greek compounds = close, dense, compact; as *Pycnocephalus,* or close-headed; a term sometimes applied to very compact kinds of inflorescence.

Pygmeus.—Dwarf. See *Pumilus.*

Pyramidalis.—Having the figure of an angular cone, but more frequently used as an equivalent for conical, as the prickles of some Roses, the root of Carrot, the heads of many trees.

Pyrena.—The stone found in the interior of the drupe and similar fruits, caused by the hardening of their endocarp.

Pyrenium.—Either the receptacle or perithecium of certain Fungals.

‡ *Pyrenarium,* ‡ *Pyridium.*—The same as Pome.

Pyriformis.—See *Pear-shaped.*

Pyrros.—In Greek compounds = flame-coloured or fiery.

Pyxis, Pyxidium, ‡ *Pyxidula,* (adj. *Pyxidatus.*)—The same as scyphus; also a capsule opening by a lid as in Hyoscyamus or Anagallis. (*cccxli.*)

CCCXLI.

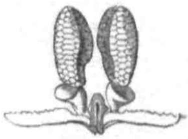
Quadri.—In Latin compounds = four times.

Quadridigitato-pinnatus.—Having four digitate divisions, each of which is pinnated. (*cli*).

‡ *Quadrieremus.*—The same as *Cœnobio.*

Quadrifoliate.—When the petiole bears four leaflets from the same point.

Quadricruris.—Having four legs or arms, as in the retinaculum of some Asclepiads. (*cccxlii*).



CCCXLII.

‡ *Quadrihilatus.*—Having four apertures, as is the case in certain kinds of pollen.

Quadrijugus.—Consisting of four pairs (of leaflets).

Quartine.—A fourth integument counting from the outside, supposed to occur in some ovules; but in reality a mere layer of either the secondine or nucleus.

‡ *Quasiradiatus.*—Slightly radiant; a term applied to the heads of some Composites, whose florets of the ray are small and inconspicuous.

Quaterni, Quaternate.—Growing in fours.

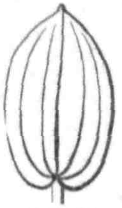
Quinate.—Growing in fives; as when a petiole bears five leaflets from the same point; it is then, however, digitate.

Quincuncial.—A kind of æstivation, in which out of five parts two are exterior, two interior, and the fifth covers the interior with one margin, and has its other margin covered by the exterior; as in the calyx of the Rose. (*cccxliii.*)

CCCXLIII.

Quin, Quinqu.—In composition = five in number.

Quinquenervis.—When there are five ribs all proceeding from the same point of the base. (*cccxliv.*)



CCCXLIV.

Quintine.—A supposed integument of an ovule, the fifth counting from the exterior; but in reality the skin of the nucleus.

Quintuple nerved.—When of five ribs the four lateral spring from the middle one above its base. (*cccxlv.*)

CCCXLV.

Quintupled.—Multiplied by five.

Raceme.—An inflorescence in which the flowers are arranged singly on distinct pedicels, along a common axis (VK. 37).

‡ *Rachemorphus.*—The small zigzag toothed flowering axis of Grasses.

Rachis.—The divisions of the petiole of the leaves of Ferns. Also the axis of an inflorescence.

Rachitis.—An abortion of the fruit or seed; a disease.

Radialis.—Growing on the circumference of a circle.

Radiate, (adj. *Radiatus*).—Diverging from a common centre, like rays, as the arms of an umbel, or the ligulate florets of any Composite.

Radiatim-plicatus—Plaited in a radiating manner.

Radical.—Arising from the root, or from its crown.

Radiating, (adj. *Radians*).—Spreading from a common point, or from the circumference of a circle. Also forming apparent rays in the circumference of a circle by the enlargement of the exterior parts, as

the outer florets in the umbels of many umbelliferous plants. (*cccxlvi.*)

CCCXLVI.

Radicans.—Throwing out roots; usually applied to stems or leaves.

Radicatio, ‡ *Radicellatio.*—The manner in which roots grow or are arranged.

Radicatus.—Having a root.

Radicella.—A very small root; the young tiny roots which appear from the lower part of a young plant at the period of germination.

Radiciflorus.—The same as *Radicalis.*

‡ *Radicinus, Radiciformis.*—Being of the nature of a root.

Radicle, Radicula. — The first root of a plant, rudimentary in the embryo (SB. 77).

Radicosus.—Having a large root.

Radicula byssoidea.—The mycelium of certain Fungals.

‡ *Radiculoda.*—The radicle of Grasses.

Radius.—The circumference of the circle formed by umbels or capitula, or of other such parts.

Radii.—The peduncles of secondary umbels, or of the flowers of simple umbels.

Radii medullares.—See *Medullary.*

Radix.—The root; the descending axis; that part which is the development of a radicle. It differs from a stem not only in its origin, but in not branching symmetrically, and having no normal leaf-buds.

Ramal.—Of or belonging to a branch.

‡ *Ramastra.*—The secondary petioles or petiolules of compound leaves.

Ramealis, Rameous.—Of or belonging to the branches.

Ramenta. — Thin membranous expansions found upon the surface of plants, and resembling hairs in composition, except that they are not composed of a single longitudinal series of cells, but of many series of cells arranged on the same plane (EB. 72 w).

Ramentaceous.—Covered with ramenta, as the stems of many Ferns.

Ramus.—A branch. Any division of the stem.

Ramiparus.—Producing branches.

Ramosus.—Divided into many branches.

Ramulus (adj. *Ramulosus*). — A twig; a small branch; the least which a plant produces.

Ramusculi. — The mycelium of certain Fungals.

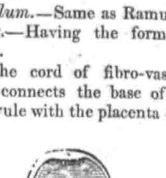
‡ *Ramusculum.*—Same as Ramulus.

‡ *Rapaceus.*—Having the form of a long Radish.

Raphe.— The cord of fibro-vascular tissue which connects the base of the nucleus of an ovule with the placenta (*cccxlvii.* r).

CCCXLVII.

Raphides, Raphida. — Crystals of various salts formed in the interior of plants by the combination of vegetable acids with alkaline bases. (*cccxlviii.*)



CCCXLVIII.

They derive their name from being most commonly acicular, or needle-shaped.

Rarus.—Thinly placed; the reverse of such terms as dense, approximated, &c.

Raven-black.—See *Pullus* and *Coracinus.*

Receptacle.—A general term expressive of a part which receives or bears other parts, as the receptacle of flowers or *clinanthium*, the receptacle of fruits or *torus*, the receptacle of ovules or *placenta.* A cup-like or other receptacle among Fungals, either forming the whole plant, or merely the part in which the organs of reproduction are placed.

Receptacle of oil.—Cysts formed among the cellular tissue of plants and containing an oily secretion, as in the so-called dotted leaves of the Orange.

Receptacles of secretion.—Any cavities of the interior into which natural secretions are drained.

Receptacula accidentalia. — Indeterminate passages in the interior filled with secretions.

‡ *Receptacula cæciformia.*—The vittæ of Umbellifers.

Receptacula succi proprii, R. tubulosa.—See *Cinenchyna* and *Laticiferous vessels.*

Receptacula vesiculosa.—See *Receptacles of oil.*

Recesses.—See *Sinus.*

Reclinate, Reclining.—Bent down upon some other part. Falling gradually back from the perpendicular, as the branches of many trees.

Reconditus.—Concealed; not easily to be seen.

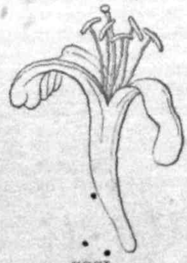
Rectinervis, Rectinervius.— See *Parallelinervis.*

Rectivenius. — Straight-veined. Having all the veins parallel as in the leaves of a Grass. (*cccxlix.*)

CCCXLIX.

Rectus.—In a right line. Not wavy or curved, or deviating from a straight direction in any way.

Recurvus, Recurvatus.—Bent, but not rolled backwards. (*cccl.*)



CCCL.

Recutitus.—Skinned. Apparently stripped of epidermis.

Red.—The common term for any pure red.

Reduplicative.—Doubled back; a term of æstivation, when the edges are valvate and doubled back.

Red brown.—See *Porphyreus.*

Reflexed.—Curved backwards excessively. (*cccli.*)

CCCLI.

Refractus.—Curved back suddenly. (*ccclii.*)

CCCLII.

‡ *Regma.*—A tricoccous fruit like that of Spurges. Any such fruit, whether the number of cocci is three or not.

Regressus. — In Morphology, signifies the change from one organ into the form of the organs that immediately preceded it; as of petals into sepals.

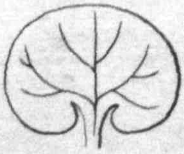
Regular.—Having all the parts of each series of a flower of a similar form and size.

Reliquiæ.—The withered remains of leaves which do not fall off, but perish upon a plant and adhere to it.

Remotus.—See *Rarus.*

Reniformis, ‡ *Renarius.* — See *Kidney-shaped.*

Reniformi-cordatus. — Both kidney-shaped and heart-shaped combined. (*cccliii.*)



CCCLIII.

Repens.—Creeping; lying flat upon the ground and emitting roots at the same time (SB. 4).

Replicate, Replicative.—When the upper part of a leaf is curved back and applied to the lower, as in the Aconite.

Repand.—Having an uneven, slightly wavy or angular margin. (*cccliv.*)

CCCLIV.

Replum.—The valve of a door; applied in Botany as if it signified a door-frame. The frame left in certain fruits by the dropping off of the valves in the act of dehiscence. (*ccclv.*)

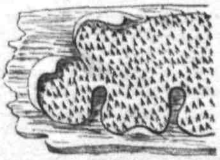
CCCLV.

Res herbaria.—Botany. Whatever relates to that subject.

‡ *Restans*—See *Persistent.*

‡ *Restibilis.*—A plant with a perennial root and annual stems; an herbaceous plant.

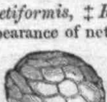
Resupinate.—Inverted in position by a twisting of the stalk; as the flowers of Orchis. Also said of those of Agaricaceous Fungals, whose hymenium is placed uppermost instead of undermost. (*ccclvi.*)



CCCLVI.

Reticulato-venosus, Retinervis, Retinervius.—Having veins with the appearance of network.

Reticulatus, Retiformis, ‡ *Retiferus.*—Having the appearance of network (*ccclvii.*)



CCCLVII.

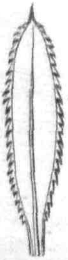
Reticulum.—A membrane consisting of crossing fibres, found in Palm-trees at the base of the petiole, either on its side or between it and the stem.

Retinaculum.—A viscid gland belonging to the stigma of Orchids and Asclepiads, and holding the pollen masses fast.

Retrocurvus.—See *Recurvus.*

Retroflexus.—See *Reflexus.*

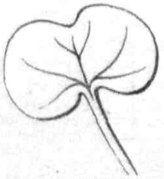
Retrorsus.—Backwards; thus, *Retrorsa folia,* are those leaves which are pressed backwards against the stem; *Retrorsum hamulosus,* having a number of little hooks directed backwards. (*ccclviii.*)



CCCLVIII.

Retroversio.—A bending backwards; an inversion, or turning upside down.

Retuse.—Terminating in a round end, the centre of which is depressed. (*ccclix.*)



CCCLIX.

Revolute.—Rolled backwards; *i. e.* out of the direction ordinarily assumed by similar other bodies; as certain tendrils, and the sides or ends of some leaves.

Revolutiva.—When the edges are rolled backwards spirally on each side (Link); as in the leaf of the Rosemary. A term of æstivation. (*ccclx.*)

CCCLX.

‡ *Rhabdus.*—The stipe of certain Fungals.

Rhegma.—See *Regma.*

Rhizanthus.—The same as *Radicalis.*

‡ *Rhizina.*—The young roots of Mosses and Lichens.

‡ *Rhiziophysis.*—An expansion of a radicle; as in Nelumbium.

‡ *Rhizoblastus.*—A term applied to embryos which develop roots.

Rhizocarpous, Rhizocarpicus.—Having a perennial root, but a stem which perishes annually; as herbaceous plants. The sign of these is ♃.

Rhizoideus.—Resembling a root.

Rhizoma.—A prostrate rooting stem, progressively throwing up leaves (SB. 8).

‡ *Rhizomaticus.*—Of the nature of a Rhizome.

Rhizomorphus.—Resembling a root.

‡ *Rhizopodium.*—The mycelium or spawn of Fungals.

Rhizos.—In Greek compounds = root.

‡ *Rhizula.*—The young root of Mosses and Lichens.

Rhodo.—In Greek compounds = red.

Rhomboid, Rhombeus, Rhomboidalis.—Oval, a little angular in the middle; as the leaf of Hibiscus rhombifolius. (*ccclxi.*)

CCCLXI.

Rhytidoma.—A formation of plates of cellular tissue within the liber or mesophlœum.

Rib.—The principal vein, or nervure which proceeds from the petiole into a leaf. Also any firm longitudinal elevation.

‡ *Rictus.*—The orifice of a personate corolla.

Rima.—The cleft-like ostiolum of certain Fungals.

Rimosus, ‡ *Rimatus,* ‡ *Rimulosus.*—Marked by chinks or cracks on the surface.

Ringed.—Surrounded by elevated or depressed circular lines or bands; as the roots or stems of some plants, the cupule of several Oaks, &c.

Ringent.—See *Personate.*

Riparius.—Growing on the banks of pieces of water.

Root.—See *Radix.*

Rootstock.—See *Rhizoma.*

Rope-shaped.—See *Funalis.*

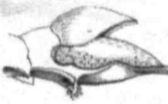
Roridus.—Dewy. Covered with little transparent elevations of the parenchyma, which have the appearance of fine drops of dew.

Rosaceus.—Having the same arrangement as the petals of a single Rose.

‡ *Roselatus.*—See *Rosulatus.*

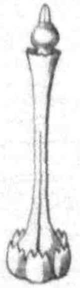
Rostratus, Rostellatus.— Terminating gradually in a hard, long, straight point; as the pod of Radish.

Rostellum.—A narrow extension of the upper edge of the stigma of certain Orchids. (*ccclxii.*)



CCCLXII.

Rostrum.—Any beak-like extension; as in the stigma of some Asclepiads. (*ccclxiii.*)

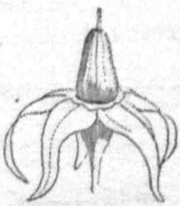


CCCLXIII.

‡ *Rosulæ.*—Little warts on the thallus of Lichens.

Rosula.—A small Rose; a Rosette; a collection of spreading leaves or petals packed one over the other in many rows; as in double Roses, or the offsets of House-leek (*cccxxxiv.*)

Rotate, ‡ *Rotaceus,* ‡ *Rotæformis.*—Resembling a wheel. A monopetalous corolla with a spreading limb and very short tube. (*ccclxiv.*)



CCCLXIV.

Rotation.—A motion of circulation confined to the interior of the cells of plants.

Rotundatus.—Rounded off; a term usually applied to bodies which are not round themselves, but only at their ends.

Rotundus.—Orbicular, a little inclining to be oblong; as the leaf of Lysimachia nummularia, Mentha rotundifolia.

Rough, Roughish.—Covered with little hard or sharp elevations, which produce the sensation of roughness. Also applied to surfaces covered with coarse stiff hairs.

Rubellus, Rubescens, Rubens.— See *Red, Reddish.*

Ruber.—See *Red.*

Rubicundus.—Blushing; rosy red.

Rubiginosus.—Brown-red; a term usually employed to denote a surface whose peculiar colour is owing to glandular hairs.

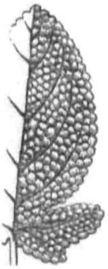
Rubor, edo.—Redness of any sort.

Ruderalis.—Growing among rubbish, or in waste places.

Rudimentary.—In an incomplete condition.

Rufescens, Rufus.—Pale red, mixed with brown.

Ruga.—A wrinkle. Hence *Rugose*, covered with wrinkled lines, the spaces between which are convex; as the leaves of Garden-sage. (*ccclxv.*)



CCCLXV.

Ruminated.—Pierced by irregular passages, filled with colouring matter or minute dead cell-membranes, as the albumen of Nutmeg.

Runcinate.—Curved in a direction from the apex to the base; as the leaf of Leontodon Taraxacum (SB. 160).

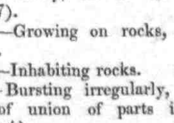
Runcinato-laciniatus.—Both runcinate and laciniate.

Runner.—A prostrate slender stem rooting at its extremity, as in the Strawberry (SB. 7).

Rupestris.—Growing on rocks, or in rocky places.

Rupicola.—Inhabiting rocks.

Ruptilis.—Bursting irregularly, not in the line of union of parts in cohesion. (*ccclxvi.*)



CCCLXVI.

Ruptinervis, Ruptinervius.—When a straight ribbed leaf has its ribs interrupted or swollen at intervals.

Rupturing.—An irregular, not definite, mode of bursting.

Rusty.—See *Ferrugineus.*

Rutilans, Rutilus.—Reddish, with a metallic lustre. Also brick-red.

Sabulosus.—Growing in sandy places.

Sac of the embryo.—The vesicle of the nucleus of an ovule, within which the embryo is formed.

Sacciform.—Having the form of a bag.

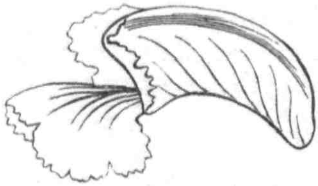
Sacculus.—A little bag. The peridium of certain Fungals.

Saccus.—A bag or cup; a term sometimes applied to the coronet of Stapelia, &c.

‡ *Sacellus.*—An achænium or caryopsis inclosed within a hardened calyx, as in Marvel of Peru (VK. 345, g).

Saccharatus.—Having a sweet taste.

Saddle-shaped.—Oblong, with the sides hanging down like the laps of a saddle. (*ccclxvii.*)



CCCLXVII.

Saffron-coloured.—Deep orange-coloured, with a dash of brown.

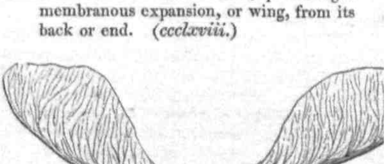
Sagittatus.—Gradually enlarged at the base into two acute straight lobes, like the head of an arrow; as the leaf of Rumex Acetosella (EB. 118, b).

Salinus, Salsus.—Growing in salt places. Having a salt taste.

Salsuginosus.—Growing in places inundated with salt water.

Salver-shaped.—See *Hypocrateriformis.*

Samara.—An indehiscent fruit, producing a membranous expansion, or wing, from its back or end. (*ccclxviii.*)



CCCLXVIII.

Samaroid.—Resembling a Samara.

Sanguine, Sanguineus.—Dull red passing into brownish black.

Sap, Sapa.—The juice of a plant. "Lac niveum potes purpureamque sapam."—*Virg.*

Sapidus.—Having a pleasant taste.

Sapor.—The taste which a thing has.

‡ *Sarcobasis.*—The same kind of fruit as the Carcerulus.

Sarcocarp.—The fleshy part of the pericarp lying between the epicarp and endocarp.

Sarcodermis.—An intermediate fleshy layer in the testa of some seeds; a layer of either the primine or secondine.

‡ *Sarcoma.*—One of the names of the disk.

‡ *Sarmentidium.*—A group of cymes or spikes arranged centrifugally, as the flowers are in the cyme itself.

Sarmentum.—A runner, such as that of the Strawberry (SB. 7).

‡ *Sautellus.*—A deciduous bulb formed in the axils of leaves, or round the summit of a root.

Sawed.—See *Serrate.*

Saxatilis, osus, icolus.—Living on rocks, or stones.

Scaber.—Rough to the touch.

Scabridus, Scabriusculus. — Slightly rough to the touch.

Scalariformis.—Ladder-shaped; the name of the tubes of vascular tissue found in Ferns (EB. 37).

Scales, (adj. *Scaly*).—Small rudimentary close-pressed leaves, resembling minute scales.

Scalpelliformis.—Having the form of a common penknife blade, but planted vertically on a branch. (*ccclxix.*)

CCCLXIX.

Scandens. — Climbing—by whatever means, except by twisting.

Scape.—A long naked, or nearly naked, peduncle, which rises up from the crown of a root. (*ccclxx.*)

CCCLXX.

Sometimes applied to the stipe of Fungals.

‡ *Scapellus.*—The caulicle, or neck formed between the root and cotyledon at the time of germination.

Scaphidium.—A hollow case containing spores in Algals.

‡ *Scaphium.*—The carina or keel of papilionaceous flowers.

Scarious.— Having a thin, dry, shrivelled appearance; as the involucral leaves of many species of Centaurea.

Scarlet.—See *Coccineus.*

‡ *Scarrose.*—See *Squarrose.*

Scarred.—Marked by the scars left by bodies that have fallen off: the stem, for instance, is scarred by the leaves that have fallen.

Scattered.—Used in opposition to whorled, or opposite, or ternate, or similar terms.

Schistaceus.—Slate grey.

Scimitar-shaped.—See *Acinaciformis.*

‡ *Scleranthum.*—The same kind of fruit as the Sacellus or Diclesium.

Scleroid.—Having a hard texture.

Sclerogen. — The hard matter deposited by some plants in the interior of their cells, as in those forming the shell of the Walnut.

Scobiformis.—Having the appearance of fine sawdust.

‡ *Scobina.*—The zigzag rachis of the spikelets of Grasses.

Scorpioid.—An inflorescence which is rolled up towards one side in the manner of a crozier, unrolling as the flowers expand. (*ccclxxi.*)

CCCLXXI.

Scrobiculatus.—Marked by little depressions See *Pitted.*

Scrotum.—A pouch. The volva of some Fungals.

Scrotiformis.—See *Pouch-shaped.*

Scurf.—The loose scaly matter that is found in some leaves, &c. See *Lepidote.*

Scutatus.—See *Buckler-shaped.*

Scutati pili.—The same as what are generally called Lepides, which see.

Scutiform.—See *Buckler-shaped.*

‡ *Scutum.*—The broad dilated stigma of some Asclepiads, as Stapelia.

Scypha.—The cup-like dilatation of the podetium of Lichenals, having shields on its edge. (*cccxxx.*)

Ruber.—See *Red.*

Rubicundus.—Blushing; rosy red.

Rubiginosus.—Brown-red; a term usually employed to denote a surface whose peculiar colour is owing to glandular hairs.

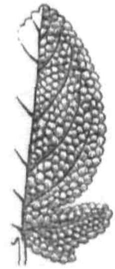
Rubor, edo.—Redness of any sort.

Ruderalis.—Growing among rubbish, or in waste places.

Rudimentary.—In an incomplete condition.

Rufescens, Rufus.—Pale red, mixed with brown.

Ruga.—A wrinkle. Hence *Rugose*, covered with wrinkled lines, the spaces between which are convex; as the leaves of Garden-sage. (*ccclxv.*)



CCCLXV.

Ruminated.—Pierced by irregular passages, filled with colouring matter or minute dead cell-membranes, as the albumen of Nutmeg.

Runcinate.—Curved in a direction from the apex to the base; as the leaf of Leontodon Taraxacum (SB. 160).

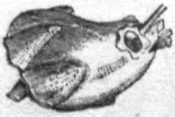
Runcinato-laciniatus.—Both runcinate and laciniate.

Runner.—A prostrate slender stem rooting at its extremity, as in the Strawberry (SB. 7).

Rupestris.—Growing on rocks, or in rocky places.

Rupicola.—Inhabiting rocks.

Ruptilis.—Bursting irregularly, not in the line of union of parts in cohesion. (*ccclxvi.*)



CCCLXVI.

Ruptinervis, Ruptinervius.—When a straight ribbed leaf has its ribs interrupted or swollen at intervals.

Rupturing.—An irregular, not definite, mode of bursting.

Rusty.—See *Ferrugineus.*

Rutilans, Rutilus.—Reddish, with a metallic lustre. Also brick-red.

Sabulosus.—Growing in sandy places.

Sac of the embryo.—The vesicle of the nucleus of an ovule, within which the embryo is formed.

Sacciform.—Having the form of a bag.

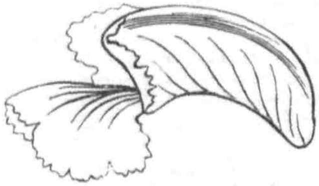
Sacculus.—A little bag. The peridium of certain Fungals.

Saccus.—A bag or cup; a term sometimes applied to the coronet of Stapelia, &c.

‡ *Sacellus.*—An achænium or caryopsis inclosed within a hardened calyx, as in Marvel of Peru (VK. 345, g).

Saccharatus.—Having a sweet taste.

Saddle-shaped.—Oblong, with the sides hanging down like the laps of a saddle. (*ccclxvii.*)



CCCLXVII.

Saffron-coloured.—Deep orange-coloured, with a dash of brown.

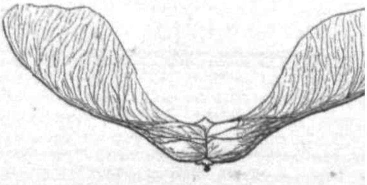
Sagittatus.—Gradually enlarged at the base into two acute straight lobes, like the head of an arrow; as the leaf of Rumex Acetosella (EB. 118, b).

Salinus, Salsus.—Growing in salt places. Having a salt taste.

Salsuginosus.—Growing in places inundated with salt water.

Salver-shaped.—See *Hypocrateriformis.*

Samara.—An indehiscent fruit, producing a membranous expansion, or wing, from its back or end. (*ccclxviii.*)



CCCLXVIII.

Samaroid.—Resembling a Samara.

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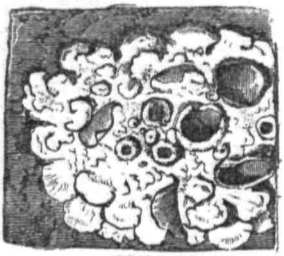
Scutati pili.—The same as what are generally called Lepides, which see.

Scutiform.—See *Buckler-shaped.*

‡ *Scutum.*—The broad dilated stigma of some Asclepiads, as Stapelia.

Scypha.—The cup-like dilatation of the podetium of Lichenals, having shields on its edge. (*ccc xxx.*)

Scutellum.—Among Lichenals is such a shield as that of Parmelia, formed with an elevated rim derived from the thallus. (*ccclxxii.*)



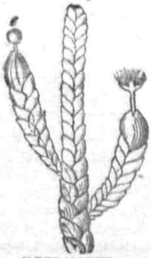
CCCLXXII.

‡ Also the second and anterior cotyledon found in Wheat.

Scutelliform.—The same as Patelliform, but oval, not round, as the embryo of Grasses. (*ccclxxiii.*)

CCCLXXIII.

‡ *Scyphulus.*—The bag or cup out of which the seta of Scale-mosses proceeds. (*ccclxxiv.*)



CCCLXXIV.

‡ *Scyphus.*—The coronet of such plants as Narcissus.

Sea-green.—See *Glaucescens.*

Sectile.—Cut into small pieces, as the pollen masses of some Orchids. (*ccclxxv.*)

CCCLXXV.

Sectus.—Divided down to the base.

Secundine.—The second integument of an ovule, within the primine and lying over the nucleus.

Secund.—Having all the flowers or leaves or other organs turned towards the same side. (*ccclxxvi.*)

CCCLXXVI.

‡ *Secundinæ internæ.*—The albumen of the seed.

Secretion.—Any organic but unorganized substance produced in the interior of plants.

‡ *Sedes floris.*—The torus of a flower.

Sellæformis.—See *Saddle-shaped.*

Semen.—The seed of flowering plants.

Semen corniculatum. — The receptacle of certain Fungals.

Semi.—In composition = half, or one side only.

Semi-amplexa, Semi-amplectens, Semi amplexicaulis.—Half-clasping a stem.

Semi-anatropous.—See *Hemianatropus.*

Semi-cordatus.—Heart-shaped on one side only.

Semi-flosculosus.—Having the corolla split and turned to one side, as in the *ligula* of Composites, which see.

Semi-hastatus.—Hastate on one side only.

Semi-lunatus.—See *Crescent-shaped.*

Seminatio.—The act of dispersing seeds naturally.

‡ *Seminulum.*—A spore.

Semi-ovatus.—Ovate on one side only.

Semi-pollicaris.—Half-an-inch long.

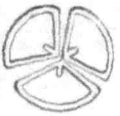
Semi-reniformis.—Reniform on one side only.

Semi-sagittatus.—Arrow-headed on one side only.

Semi-septatus.—Half-partitioned. Having a dissepiment which does not project into the cavity to which it belongs sufficiently to cut it off into two separate cells. (*ccclxxvii.*)

CCCLXXVII.

‡ *Semi-staminarius.*—A flower, a part of whose stamens are changed into petals.
Semi-teres.—See *Half-terete.*
Sempervirens.—Evergreen. Retaining greenness during winter as well as summer.
Seni, Senarius.—In sixes. *Senus.*—The sixth.
Sepala.—The divisions of the calyx.
Sepaline.—Belonging to a sepal.
Sepaloid.—Resembling a sepal in appearance.
Sepicolus.—Inhabiting hedge-rows.
Septum.—The partition of an ovary or fruit produced by the sides of the carpels brought together and consolidated. Also a partition of any kind.
Septalis.—Of or belonging to a septum.
Septatus.—Partitioned off by septa.
Septenatus, Septenus.—Growing in sevens.
Septicidal.—A mode of dehiscing, in which the fruit is resolved into its component carpels, which split asunder through the dissepiments. (*ccclxxviii.*)



CCCLXXVIII.

Septiformis.—Having the appearance of a dissepiment, as is the case with the placenta of some plants, as Plantago.
Septifragal.—A mode of dehiscing, in which the backs of the carpels separate from the dissepiments, whether formed by their sides, or by expansions of the placenta. (*ccclxxix.*)

CCCLXXIX.

Septilis.—Of or belonging to dissepiments.
Septulum.—A little partition of any kind.
Serialis.—Arranged in rows.
Sericeus.—Silky. Covered with very fine close-pressed hairs, silky to the touch.
Serotinus.—Appearing late in a season, or later than some other part or species allied to it.
Serra, Serratura.—The saw-toothings at the edge of leaves and similar bodies.
Serratus.—Having sharp, straight-edged teeth pointing to the apex. When these teeth are themselves serrate, we say Biserrate or Duplicato-serrate.
‡ *Sertulum.*—A simple umbel.
Sesqui.—This term, prefixed to the Latin name of a measure, shows that such measure exceeds its due length by one half; thus, *sesquipedalis* means a foot and a half.
Sessile.—Sitting close upon the body that supports it, without any sensible stalk.
Seta.—A bristle of any sort; a stiff hair; a slender straight prickle. Also the stalk which bears the spore-case of plants of the Museal Alliance.
Setaceo-serratus.—Having the serratures ending in bristle-like points.
Setiformis.—Having the form of a seta.
Setose.—Covered with stiff hairs or setæ.
Setula.—The stipe of certain Fungals.
Sextuplici.—Six times.
Shaggy.—See *Hirtus.*
Sheath.—See *Vagina.* A part which is rolled round a stem or other body.
Shields.—The reproductive bodies of Lichenals. See *Apothecia.*
Shield-shaped.—See *Clypeatus.*
Sigmoid.—Having a form somewhat resembling the letter S. (*ccclxxx.*)

CCCLXXX.

Silicle, Silicula.—A siliqua about as broad as long, or broader. ‡ Among Algals, see *Carpoclonium.*
Siliqua.—The long pod-like fruit of Crucifers, consisting of a pair of valves applied to a frame on which the seeds grow. (VK. 246).
Silky.—See *Sericeus.*
Silver-grain.—The glittering plates observed in the wood of many Exogens, and caused by the division of the medullary plates.
Silvery.—Having a silvery lustre. See *Argenteus.*
‡ *Similary parts.*—The elementary organs or tissues of plants, such as cellular tissue, woody tissue, spiral vessels, &c.
Simple.—Not consisting of several distinct parts.
Simplicissimus.—Not divided or branched at all.
Sinuated.—Having the margin alternately uneven with deep concavities and convexities.
Sinuato-dentatus.—Sinuated and dentate at the same time.
‡ *Sinuolatus.*—See *Repand.*

Sinistrorsus.—Twining to the left hand; a term usually confined to the stems of plants. (*ccclxxxi.*)

CCCLXXXI.

Sinus.—The recesses formed when the edge of any part is lobed. ‡ The pores found in some Fungals.

Situs.—The position occupied by an organ. ‡ Also the mycelium of certain Fungals.

Slashed.—See *Laciniatus.*

Slate-grey.—Grey, bordering on blue.

Slimy.—See *Mucous.*

Smaragdinus.—Grass-green.

Smoky.—Having a dull greyish-black colour. See *Fumeus.*

Smooth.—Free from asperities or hairs, or any sort of unevenness.

Soboles.—A creeping rooting stem (SB. 4).

Solidus.—Not hollow, or furnished with internal cavities of any kind.

Solitary.—Growing singly.

‡ *Solubility.*—The property of splitting spontaneously in an indefinite manner.

Solutus.—Completely separate from neighbouring parts.

Sooty.—As if smeared with soot. See *Fuligineus.*

Sordidus.—Any dirty or muddy colour; *Sordidè luteus* = dirty yellow.

Soredia.—Collections of gonidia breaking in clusters through the surface of the thallus of Lichens.

Sori.—The patches of spore-cases found in Ferns.

Sorosis, Sorosus.—The fleshy mass formed by a consolidation of many flowers, seed-vessels, and their receptacles, as the Pine Apple, the Bread-fruit, &c. (VK. 183.)

Spadiceus.—Bright brown; pure and very clear brown.

Spadix.—A branch or axis bearing numerous closely packed sessile flowers, and inclosed in a spathe or spathes. A spike inclosed in a spathe (SB. 232, 1).

Span.—Nine inches, or the space between the thumb and little finger when spread out. See *Dodrans.*

Sparsus.—Scattered; irregularly distributed.

Spathaceus.—Having the appearance of a spathe, or being furnished with one.

Spathe.—A large bract rolling over an inflorescence and guarding it while young (SB. 232).

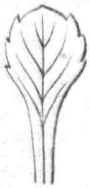
‡ *Spathellæ.* — The paleæ and glumes of Grasses; the glumes only.

‡ *Spathellulæ.*—The paleæ of Grasses.

‡ *Spathilla.*—A secondary spathe in a spathaceous inflorescence, as in Palms.

‡ *Spathæus.*—Having a very large spathe.

Spathulate.—Oblong, with the lower end very much attenuated, so that the whole resembles a druggist's spatula. (*ccclxxxii.*)



CCCLXXXII.

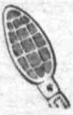
Specific characters.—The short descriptions by which Botanists endeavour to distinguish one species from another.

‡ *Spermophorum.*—A cord which bears the seeds of some plants; also the placenta itself.

Spermangium. — The case containing the spores of Algals.

Spermatocystidium. — The supposed male organs of the Muscal Alliance. See *Antheridium.*

Spermatoidia.—Small cells containing gonidia, in Algals. (*ccclxxxiii.*)



CCCLXXXIII.

Spermatium, Spermatidium.—The spore of an Algal.

‡ *Spermidium.*—One of the names of the achænium.

‡ *Spermodermis.*—The skin or testa of a seed.

‡ *Spermodophorum.*—The end of the peduncle of Umbellifers.

‡ *Spermotheca.*—The seed-vessel; the case in which seeds are contained.

Spermum.—In Greek compounds = a seed, or any seed-like part.

Sphærula ascigera.—The receptacle of certain Fungals.

Sphærenchyma. — Spherical or spheroidal cellular tissue; such as is found in the pulp of fruits See *Merenchyma* (EB. 2).

‡ *Sphæroblastus.*—A cotyledon which rises above ground, bearing at its end a spheroid tumour.

Sphærocephalus.—Having flowers growing in close spherical heads. See *Sorosis.*

Sphærospore.—The quadruple spore of some Algals.

Sphalerocarpium.—A bony one-seeded seed-vessel, inclosed in a fleshy cup, not belonging to the pericarp.

Spheroidal.—Any solid with a figure approaching to tha· of a sphere.

Spherula. — A globose peridium through whose opening are emitted sporidia buried in pulp.

Spiculæ.—The points of the basidia of Fungals; also their Aciculæ.

‡ *Spicula,* (adj. *Spiculate*).—A fine, fleshy, erect point.

Spike, Spica.—An inflorescence consisting of flowers sessile on a long axis (EB. 139 a).

Spike, compound.—A collection of spikes arranged in a racemose manner.

Spikelet.—The small terminal collection of florets among Grasses. See *Locusta.*

‡ *Spilus.*—The hilum of Grasses.

Spindle-shaped. —See *Fusiform.*

Spine.—A stiff, sharp-pointed body, consisting of woody tissue covered with cellular tissue. A hardened leaf-stalk, stipule, abortive branch, or any other process into the composition of which woody tissue enters.

Spinescens, Spinosus, Spiniger. — Covered with spines.

Spines of the leaves.—Are the hardened extremities of lobes; or in some cases superficial spiny elevations.

Spinosodentatus.—Having teeth tipped with spines (EB. 119 a).

Spinuloso-ciliatus.—Ciliated with fine spines.

Spithama, (adj. *Spithamæus*).—Seven inches, or the space between the thumb and the fore-finger separated as widely as possible.

Splendens.—The same as polished, but having the lustre a little broken from slight irregularity of surface.

Spodo.—In Greek compounds = ash-grey.

‡ *Spongiola pistillaris.*—The stigma.

Spongiola seminalis. — A wart-like excrescence found on some seeds. (*ccclxxxiv.*)

CCCLXXXIV.

Spongiole, Spongelet.—The young tender extremity of a root, by which fluid food is absorbed from the earth.

Spongy.—Having the texture of a sponge, that is to say, very cellular, with the cellules filled with air; as the coats of many seeds.

‡ *Sponsalia plantarum.*—The period at which a flower is fertilized.

Spora, Sporidium, Sporulum, Sporangiolum, Sporidiolum. — The spores of certain Fungals.

Sporangium.—See *Spore-case.* Whatever contains spores. ‡ Sometimes applied to the volva among Fungals. Léveillé defines it to be among Fungals a globular or long cell containing spores.

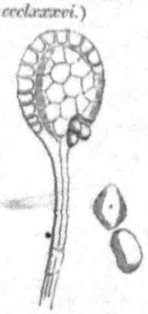
‡ *Sporangidium.* — The columella of Urn-mosses. (*cvii.*) The spore-case of certain Fungals.

Sporangiolum.—A case containing sporidia.

Sporangiophorum.—The axis or columella on which are borne the spore-cases of some Ferns (VK. 58).

Spore.—See *Sporules.*

Spore-case. — The immediate covering of spores. (*ccclxxxvi.*)



CCCLXXXV

Sporidiola.—The spores or sporules of Thallogens and Acrogens.

Sporidium. — The sac which contains the granular masses of Zygnema: a membranous case containing *sporidiola,* or sporules, and inclosed in an ascus. (*ccclxxxvi.*)

CCCLXXXVI

According to Fries, granules that resemble spores, but are of a doubtful nature.

Sporocarpium.—The involucre of Pepperworts. The spore-cases of Lycopods. Any spore-case. ‡ The shield of a Lichen.

‡ *Sporidochium.*—The receptacle or even the stipe of certain Fungals.

Sporocladium.—A branch on which the reproductive bodies of some Algals are found.

Sporocysta.—The spore-case of Algals.

Sporodermis.—The skin of a spore.

Sporophyllum.—A leaf-like division of the thallus of an Algal bearing fruit. See *Carpoclonium.*

‡ *Sporotamium.* — The cellular layer that is immediately underneath the disk of the shield of a Lichen.

Sporules, Spores.—The seed-like reproductive bodies of Thallogens and Acrogens.

Spreading.—Having a gradually outward direction; as petals from the ovarium.

Spur.—A hollow terete extension of some part of the flower. See *Calcar.*

Squama. — A scale-like rudimentary leaf, such as coats and guards the leaf-bud.

Squamatus.—Covered with small scale-like leaves.

Squamatio.—A disease, consisting in a preternatural formation of rosettes of scale-shaped leaves; such as occasionally appears on the Rose-willow.

Squamella.—A scale-like membranous bract, such as is found very commonly on the receptacle of Composites.

Squamulæ.—The hypogynous scales of Grasses.

Squamose.—Scale-like.

Squarrose.—Covered with bodies which spread at right angles, or at a greater angle, from the surface which bears them; or being so arranged. (*ccclxxxvii.*)

CCCLXXXVII.

Squarroso-dentatus.—Having teeth which do not lie in the plane of the leaf, but form an angle with it (EB. 119, f).

Squarroso-laciniatus.—Lacerated in a squarrose way.

Squarroso-pinnatipartitus. — Deeply pinnatifid with squarrose divisions, as the leaf of Achillea Millefolium.

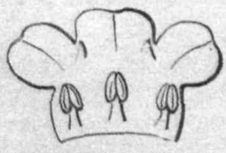
Squarroso-pinnatisectus.—Pinnatifid, with the segments so straggling as to appear on different planes.

Stachys.—In Greek compounds = a spike.

Stalklets. — Secondary petioles; petiolules; the stalks of leaflets.

Stamen.—That organ of the flower to which the pollen belongs (EB. 163).

Stamen, sterile. — A body belonging to the series of the stamens, but without pollen. (*ccclxxxviii.*)



CCCLXXXVIII.

Stamineal.—Consisting of stamens.

Staminidia.—The so-called anthers of Cryptogamic plants. See *Antheridia.*

Staminigerus.—Bearing stamens.

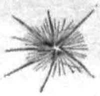
‡ *Staminodium.*—A rudimentary stamen, or what appears to be so.

Standard.—The fifth petal of a papilionaceous flower.

Starry.—Arranged in rays like the points of a star. See *Stellate.*

Stellate, ‡ *Stelliformis,* ‡ *Stellulatus.* — Having a number of narrow divisions placed round the stem like the rays of a star.

Stellato-pilosus.—Having hairs formed in a stellate manner. (*ccclxxxix.*)



CCCLXXXIX.

Stem.—That part of a plant which bears or has borne leaves or their rudiments; the ascending axis of growth. It is either subterranean, or exposed to the air and light.

Stem-clasping.—When the base of a leaf surrounds a stem. See *Amplexicaul.*

Stemless. — Having no visible or obvious stem.

‡ *Stephanoum.*—An inferior achænium like that of Composites.

‡ *Sterigmata.*—The elevated lines or plates upon stems produced by the bases of decurrent leaves. (*cccxc.*)

CCCXC.

‡ *Sterigmum.*—An indehiscent superior many-celled dry fruit, such as that of Tropæolum.

Sterilitas.—Incapable of producing seeds.

Stichidium.—See *Carpoclonium.*

Stichus.—In Greek compounds = a row of anything.

Stigma.—That surface of a style, usually at its extremity, to which the pollen adheres when it fertilizes the ovules.

Stigmata. — The points of the basidia of Fungals.

Stigmatoideus.—Having the appearance of a stigma.

‡ *Stigmatophorus.*—That part of the style of Composites which bears the stigmata.

‡ *Stigmatostemon.*— A body formed by the union of anthers to the stigma. *DC.*

Stimuli, (adj. *Stimulans*). – Stings; sharp stiff hairs, containing an acrid fluid which produces pain when it pierces the skin (EB. 73 b).

‡ *Stimulosus.*—Covered with stings.

Stipels.—Secondary stipules, such as are found at the base of the leaflets of compound leaves.

Stipes.—The petiole of the leaves of Ferns. The stem which carries the pileus of such Fungals as Agarics. ‡ A small flower-stalk. The trunk of the Ferns.

‡ *Stipiferus.*—Bearing small flower-stalks, as the receptacle of some Composites.

‡ *Stipiformis.*—Having the appearance of the trunk of an Endogenous tree ; as the Papaw and other simple stemmed Exogens.

Stipitate. — Elevated on a stalk which is neither a petiole nor a peduncle; as, for example, some kinds of carpels.

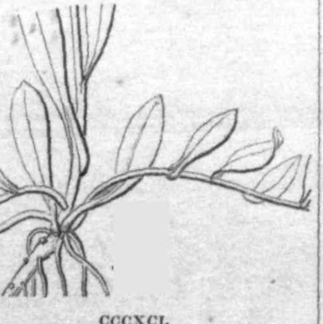
Stipularis.—Of or belonging to, or standing in the place of stipules.

Stipules.—Processes of various kinds arising from the base of a leaf, and usually from its sides. See *Ochrea*, *Reticulum*, *Lignea*, &c.

‡ *Stirpalis.*—Growing upon a stem.

Stirps.—A race. A permanent variety : as the Red Cabbage.

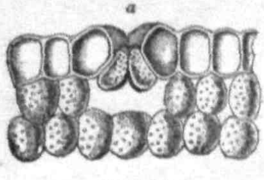
Stole, *Stolo.*— A sucker which at first appears at the surface of the earth, and then turns downwards, piercing the soil or rooting into it. (*cccxci.*)



CCCXCI.

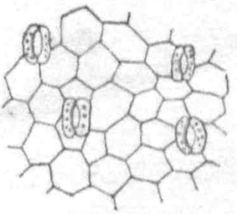
Stoma.—The ostiolum of certain Fungals.

Stomate, *Stomatium.*—An organic aperture in the skin of a plant, by means of which respiration is maintained, to provide for which, it is always placed over a cavity in the parenchyma, beneath it. (*cccxcii a.*)



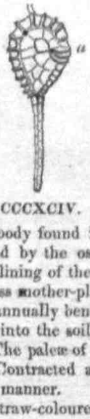
CCCXCII.

Stomatiferus.—Bearing stomates. (*cccxciii.*)



CCCXCIII.

‡ *Stomium.*—An opening provided on the side of the spore-cases of Ferns, through which dehiscence takes place. (*cccxciv a.*)



CCCXCIV.

Stone.—A hard body found in certain fruits, and produced by the ossification of the endocarp or lining of the fruit.

Stool.—A stemless mother-plant used for propagation by annually bending its branches or "layers" into the soil.

‡ *Stragulum.*—The paleæ of Grasses.

Strangulated.—Contracted and expanded in an irregular manner.

Stramineus.— Straw-coloured. Dull yellow mixed with white.

Strap-shaped.—See *Ligulatus.*

Stratum —A layer of tissue. *Str. cellulosum* is a cellular layer forming the exterior of bark, immediately below the epidermis. *Str. corticale* is any layer belonging to bark; and *Str. ligneum* is one of the woody layers in the stem of Exogens. *Str. sporidiiferum*, the flesh, *Str. sporophorum*, the hymenium of certain Fungals.

Straw.—The above-ground stem of Grasses.

Striæ, (adj. *Striatus*).—Streaks. Any sort of longitudinal lines, whether arising from veins, or fine streaks of colour, or long channellings.

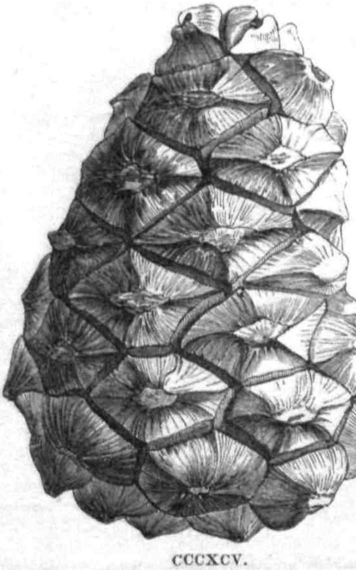
Strictus.—Very upright, or very straight.

Strigose.—Covered with *strigæ*; *i.e.* sharp close-pressed rigid hairs. Linnæus considers this word synonymous with hispid.

Striped.—Marked with longitudinal stripes of colour.

Strobilaceus, *Strobiliformis*.—Having the appearance of a strobilus.

Strobilus.—A Fir-cone. An imbricated scaly inflorescence; a collection of hard scales, representing distinct flowers, arranged spirally, but closely imbricated. (*cccxcv.*)



CCCXCV.

‡ Any fruit which resembles a Fir-cone.

Stroma.—A mass in which perithecia are imbedded. (*cccxcvi.*)

CCCXCVI.

Also applied to the mycelium of Fungals.

Strophes.—The spirals formed in the development of leaves. *Naumann*.

Strophiole.—A tubercle found surrounding the hilum of some kinds of seeds.

Strumiformis.—Having the appearance of a struma.

Strumulosus.—Furnished with a small struma.

Stupa, (adj. *Stuppeus*, *Stuposus*).—Tow. A tuft of long hairs.

‡ *Stylatus*.—Having a persistent style.

Strombus-shaped, *Strombuliformis*.—Twisted in a long spire, so as to resemble the convolutions of the shell called a Strombus; as the pod of Acacia strombulifera, or Medicago polymorpha. (*cccxcvii.*)

CCCXCVII.

Struma.—A cushion-like swelling. A goitre. A protuberance at the base of the spore-cases of some Urn-mosses. (*cccxcviii.*)

CCCXCVIII.

Style.—The narrowed upper end of a carpellary leaf; the part which bears the stigma (EB. 175 b; SB. 60, 65, &c.)

Stylinus.—Of or belonging to the style.

‡ *Styliscus*.—The channel which passes from the stigma, through the style into the ovary.

Stylopodium.—The double fleshy disk from which the styles of Umbellifers arise.

‡ *Stylostemon*.—An epigynous stamen.

‡ *Stylus*.—The ostiolum of certain Fungals.

Stylotegium.—The coronal or orbicular mass which forms part of the andrœceum of such Asclepiads as Stapelia (EB. 161 a).

‡ *Stypticus*.—Astringent.

Sub.—In composition, usually signifies *somewhat*, as *sub-rotund*, somewhat round; also *nearly*, as *sub-insipidus*, nearly insipid.

‡ *Subbifido-rumpens*.—Bursting into somewhat two divisions.

Suber, (adj. *Suberosus*).—Cork. The epiphlœum of bark, when it acquires an elastic soft texture, and is preternaturally enlarged.

Submersus, ‡ *Submersibilis*.—Buried beneath water.

Subramealis.—Growing on a branch below a leaf.

Subramosus.—Having a slight tendency to branch.

Subroseus.—Having something of a Rose-colour.

Subuli.—The aciculæ or sharp processes formed by some Fungals.

Subulatus, ‡ *Subuliformis.*—Awl-shaped. Linear, very narrow, tapering to a very fine point from a broadish base.

Succisus.—Abruptly broken off, or appearing to be so.

Succosus.—Full of juice.

Succubus.—A term applied to the stipules of Scale-mosses.

Succulent.—Very cellular and juicy, as the stems of Stapelias.

Sucker.—A shoot thrown up by a plant from beneath the surface of the ground, as is common with Roses, &c.

Sudorificus.—Having the power of causing perspiration.

Suffrutex.—An undershrub. A shrub of small size, and herbaceous at the ends of the shoots, though woody at their base.

‡ *Suffultus.*—The plate or disk forming the axis of a bulb gives rise, when much lengthened, to the term Bulbus suffultus. —*Endl.*

Sulcato-rimosus.—Furrowed and cracked like the cotyledons of a Spanish chestnut.

Sulcatus.—Furrowed.

Sulci.—The lamellæ of certain Fungals.

Sulphur-coloured, Sulphureus.—A pale bright yellow, with a mixture of white.

Superficiarius.—Found at the surface.

Superficies corporis, placentaris.—The hymenium of certain Fungals.

Superior.—Growing above anything. A calyx is *half-superior* when it appears to grow from above the base of an ovary; and absolutely superior when it appears to grow from the top of the ovary. On the contrary, the ovary is superior when it grows above the origin of the calyx. (SB. 45).

Superposed, Superpositus.—Stationed above anything; placed one above another, as ovules in an ovary.

Supervolute.—When one edge is rolled inwards, and is enveloped by the opposite edge also rolled inwards, as the leaves of an Apricot tree. (*cccxcix.*)

CCCXCIX.

Supervolutive.—An æstivation in which leaves are supervolute.

Supra.—Above or upon anything.

Supra-axillary.—Growing above an axil.

Supradecompound.—Divided into a multitude of pieces. So much divided that the number and mode of division cannot be precisely ascertained; as the leaves of the Carrot, Fennel, &c.

Suprafoliaceus.—Growing above a leaf.

Suprafolius.—Growing upon a leaf.

Surculus.—See *Sucker.* Also the young prostrate stem of a Moss.

Sursum.—Upwards; as *Sursum hamulosus* =bordered with hooks directed upwards; *i.e.* towards the point of the leaf. (*cccc.*)

CCCC.

Suspended.—Hanging up by the side; as many seeds (VK. 196, 3).

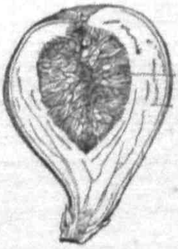
Suspensor.—A cellular cord by which the embryo of some seeds is suspended from the foramen (EB. 198).

Sutural.—Of or belonging to the suture or line of junction of two different parts. *e.g.* Sutural dehiscence is the act of splitting along the line of junction of two valves.

Sword-shaped.—See *Ensiformis.*

‡ *Sychnocarpous.*—Having the power of producing fruit many times without perishing, as is the case with all trees and herbaceous plants.

‡ *Syconus,* ‡ *Syconium.*—Such fruits as that of the Fig, consisting of a fleshy receptacle loaded with flowers, each producing its own proper seed-vessel. (*cccci.*)



CCCCI.

Sylvestris, Sylvaticus.—Growing in woods.

Sylvula.—A plantation.

Symmetry.—That kind of arrangement in which the number of parts of one series corresponds with that of the other series; as, for example, when a flower with five sepals has five petals, and five, or ten, or fifteen stamens.

‡ *Sympetalicus.*—A growing of the stamens to the petals, so as to produce the appearance of a monopetalous corolla; as in the Mallow.

‡ *Symphyantherus.*—The same as *Syngenesious.*

‡ *Symphyostemon.*—The union of stamens by their filaments. See *Monadelphous.*

Symphysis.—A growing together.
‡ *Symphytogyni.*—Flowers in which the ovary is inferior.
‡ *Symplocium.*—The spore-case of a Fern.
Syn.—In Greek compounds = union, adhesion, or growing together.
‡ *Synanthericum.*—The growing together of anthers, as in Composites. See *Syngenesious.*
‡ *Synantherus.*—A flower whose anthers are grown together.
Syncarpous.—Having a fruit whose carpels are consolidated.
‡ *Syncarpium.*—A fruit consisting of many carpels consolidated and adhering to a central receptacle or growing point, as in Magnolia.
‡ *Synedrus.* — Growing on the angle of a stem.
‡ *Synema.*—That part of the column of an Orchid which represents the filament of the stamens
Syngenesious.—Having the anthers united at their edges, so as to form a tube. (*ccccii.*)

CCCCII.

‡ *Synochorion.*—The same kind of fruit as the *Carcerulus.*
Synonymes.—Names which have the same meaning; a Synonyme is what lawyers call an *alias.*
‡ *Synorhizus.* — Having a radicle whose point is united to the albumen.
‡ *Synzygia.*—The point of junction of opposite cotyledons.

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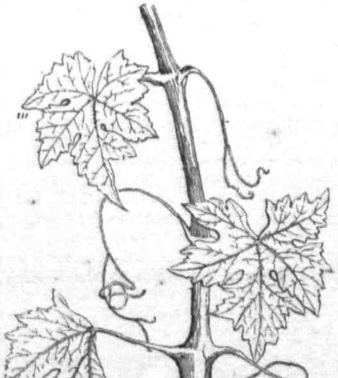
‡ *Tabacinus.* — Tobacco-coloured. A pale brown, like common Kanaster.
Tabes.—A wasting. A disease which consists in a gradual decay of the power of growth.
Tabula.—The pileus of certain Fungals.
‡ *Tabulatus.*—Consisting of layer upon layer.
‡ *Tænianus.*—Long, cylindrical, contracted in various places, in the manner of the tapeworm.
Tail-pointed.—Excessively acuminated, so that the point is long and weak. See *Caudatus.*
‡ *Talaræ.*—The wings of a papilionaceous corolla.
Talea.—A cutting. A small branch employed to propagate a plant.
Taper.—The opposite of angular: usually employed in contradistinction to that term, when speaking of long bodies. See *Terete.*
Tapering.—Gradually diminishing in diameter.
Taper-pointed.—Terminating very gradually in a point, as the leaf of Salix alba. See *Acuminate.*
Tapeworm-shaped.—See *Tænianus.*
Tap-rooted.—Having a large simple conical root, which forms a centre, round which the divisions are arranged (EB. 75 c).
Tartareous.—Having a rough crumbling surface, like the thallus of some Lichens.
Tawny.—See *Fulvus.*
Taxology, Taxonomy.—That part of Botany which relates to the laws of classification.
‡ *Tear-shaped.*—See *Lachrymæformis.*
Teeth.—Any kind of small divisions.
‡ *Tegmen.*—The glumes of Grasses. The inner skin which covers the seed.
‡ *Tegmenta.*—The scales of a leaf-bud; they are *foliacea* when modifications of leaves; *fulcracea* of stipules and petioles; *petiolacea* of petioles only; *stipulacea* of stipules only.
Tela.—The elementary tissue.
Tendril.—A twisting thread-like process by which one plant clings to another. (*cccciii.*)



CCCCIII.

Tenuis.—Thin.
‡ *Tepalum.*—The pieces of a perianth, being of an ambiguous nature, between calyx and corolla.
Tephro.—In Greek compounds = ash-grey.
‡ *Teratology.*—The same as *Morphology.*
Tercine.—A supposed third integument of an ovule, but in reality a layer of the primine or secondine, or the secondine itself.

Teredo.—Any disease in plants produced by the boring of insects.

Teres, Terete.—Tapering; free from angles, cylindrical or nearly so.

Tergeminate.—When each of two secondary petioles bears towards its summit one pair of leaflets, and the common petiole bears a third pair at the origin of the two secondary petioles; as in Mimosa tergemina. *Mirb.*

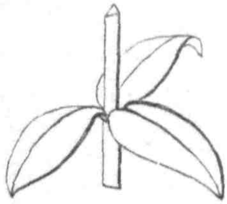
‡ *Tergispermus.*—Bearing the seed-cases on the back of leaves; as in dorsiferous Ferns.

Terminal.—Proceeding from the end.

Terminus.—A term; a technical word.

Terminology.—That part of Botany which teaches the meaning of technical terms.

Ternus, Ternate.—When three things are in opposition round a common axis. A whorl of three. (*cccciv.*)



CCCCIV.

Ternato-pinnatus. — When the secondary petioles, on the sides of which the leaflets are attached, proceed in threes from the summit of a common petiole.

‡ *Terraneus.*—Growing on dry land.

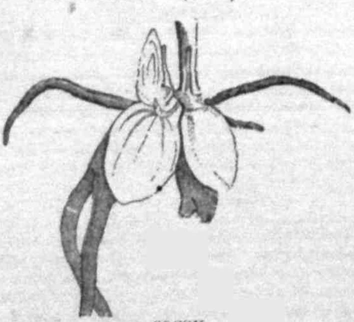
Tesselated. —When colour is arranged in small squares, so as to have some resemblance to a tesselated pavement.

‡ *Tessularis.*—When the three dimensions of a body, thickness, breadth, and length, are equal.

Testa.—The skin of a seed.

Testaceous.—Brownish yellow, like that of unglazed earthenware.

‡ *Testicular, Testiculate.*—Having the figure of two oblong bodies; as the roots of Orchis mascula. (*ccccv.*)



CCCCV.

‡ *Testiculus, Testis.*—The anther.

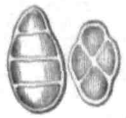
Teter.—Having a very bad smell.

Tetra.—In Greek compounds = four; as *tetraphyllus*, four-leaved; *tetrapterus*, four-winged; *tetrapyrenus*, four-stoned, &c.

‡ *Tetracamarus.*—A fruit consisting of four indehiscent one-seeded carpels.

‡ *Tetrachænium.*—A fruit formed by the adhesion of four achænia.

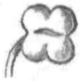
Tetrachocarpium.—The quadruple cluster of spores found in some Algals. (*ccccvi.*)



CCCCVI.

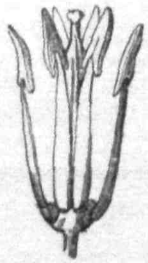
Tetracoccus.—Having four cells elastically dehiscing and separating.

‡ *Tetradymous.*—Having four cells or cases. (*ccccvii.*)



CCCCVII.

Tetradynamous.—Having six stamens, of which two are longer than the four others, which stand in pairs on opposite sides of an ovary; as in Crucifers. (*ccccviii.*)



CCCCVIII.

Tetragonus.—Having four corners.

Tetraqueter.—Having four very sharp and almost winged corners.

Tetrastichus.—Having a four-cornered spike.

‡ *Thalamicus.* — Of or belonging to the thalamus.

Thalamiflorus.—Having the stamens arising immediately from the thalamus (SB. 88,1).

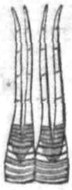
Thalamium.—A hollow case containing spores in Algals. Also the disk or lamina prolifera of Lichens, and a form of the hymenium in Fungals.

Thalamus.—The receptacle of a flower; the part on which the carpels are placed.

‡ *Thalassicus.*—Sea-green.
Thallodes.—Of or belonging to, or proceeding from a thallus.
Thallus.—A fusion of root, stem, and leaves into one general mass (VK. 29).
‡ *Thamnium.*—The branched bush-like thallus of Lichens.
Theca.—A spore-case. A shell, tube, sac or case of any kind containing spores. ‡ A cell of any sort.
‡ *Thecaphore.*—The stalk of an ovary.
‡ *Thecidium.*—One of the forgotten names of the fruit called an Achænium.
Three-edged.—Having three acute angles with concave faces; as the stems of many plants.
Thrice digitato-pinnate.—See *Ternato-pinnatus.*
Throat.—The orifice of a monopetalous flower.
Thyrse.—A panicle, whose principal diameter is in the middle between the base and apex.
Thyrsula.—The little cyme which is borne by the greater part of Labiates in the axil of their leaves.
‡ *Tigellatus.*—Having a short stalk; as the plumule of the bean.
‡ *Tigellula.*—A short stalk or filament observed in the Truffle.
Tissue.—The texture or material out of which the elementary organs of plants are constructed.
Tomentose.—Covered with dense, rather rigid, short hairs, so as to be sensibly perceptible to the touch.
Tomentum.—The down which produces the tomentose character. ‡ Also applied to mycelium.
Tongue-shaped.—Long, fleshy, plano-convex, obtuse; as the leaves of some Aloes.
Toothed.—See *Dentate.* Having any kind of small divisions.
Top-shaped.—Inversely conical, with a contraction towards the point; as the fruit of some Roses.
Torfaceus.—Growing in bogs or mosses.
Torosus, ulosus.—A cylindrical body, swollen out here and there. (*ccccix.*)

CCCCIX.

Torsivus.—Twisted spirally. The same as contorted, except that there is no obliquity in the form or insertion of the pieces; as in the petals of Oxalis.
Tortilis.—Susceptible of twisting.
Tortuous. — Having an irregular, bending, and turning direction.
Torus.—See *Thalamus.*
Trabecula, (adj. *Trabeculatus.*)—A cross-bar; as in the teeth of many Mosses. (*ccccx.*)



CCCCX.

Trachea, Trachenchyma. — Spiral vessels. Air-tubes, containing a spiral thread of considerable toughness and elasticity.
Trama.—The flesh of certain Fungals.
Transversus.—Broader than long.
Trapeziform, Trapezoid.—Having four sides, those which are opposite not being parallel; scarcely different from rhomboid. (*ccccxi.*)

CCCCXI.

Tree.—Any woody plant of perennial duration which rises from the ground with a trunk.
Tree-like. — Resembling a tree, but very small. See *Dendroides.*
Tri.—In compound words = three; as *tricostatus,* having three ribs; *tricornis,* having three horns.
Triadelphous.—Having the stamens collected into three parcels.
‡ *Triakenium.*—That kind of fruit called a Cremocarp, in which the number of carpels is three.
Triangulato-cuneatus.—Between triangular and wedge-shaped. (*ccccxii.*)

CCCCXII.

‡ *Tricamarus.* — A fruit consisting of three distinct follicles, as in Aconite.

rica.—A button-like shield belonging to the genus Gyrophora. (*ccccxiii.*)

CCCCXIII.

‡ *Tricephalus.*—Three-headed; having three crowns, or vertical points or tubercles: like many fruits composed of three carpels, originally separate at the point.

Trichidium.—A hair which bears the spores of such Fungals as Geastrum.

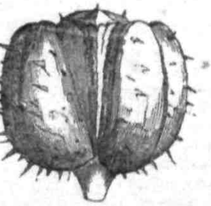
Trichoma. — The filamentous thallus of Algals, as Conferva.

Trichophorum.—The stipe of certain Fungals

Trichos.—In Greek compounds = hair-like, or hairy.

Trichotomus.—Having the divisions always in threes.

Tricoccus.—A fruit, consisting of three cocci, or elastically dihiscing shells. (*ccccxiv.*)



CCCCXIV.

Tricolor.—Consisting of three colours.

Tridigitato-pinnatus. — See *Ternato-pinnatus.*

Tridentatus, *Trident-pointed.* — When the point is truncated, and has three indentations. (*cccxv.*)

CCCCXV.

Triduus.—Lasting for three days.

Trieder.—Having three sides.

Triennis.—Lasting for three years.

Trifariam.—In three rows.

Trifidus.—Split half-way into three parts.

Trifoliolate, *Trifolius.*—Bearing three leaflets from the same point; as Clover.

‡ *Triformis.*—Bearing flowers of three different kinds; as the receptacle of some Composites.

‡ *Trifurcatus.*—Having a fork with three tines, as some hairs.

‡ *Triglans.*—Containing three nuts (glands) within an involucre, as the Spanish Chestnut.

Trigonus.—Having three angles and three plane faces, as the stem of Carex acuta.

Trihilatus.—Having three apertures, as some sorts of pollen grains.

Trijugus.—When the petiole of a pinnated leaf bears three pairs of leaflets.

Trilateralis.—A prism of three sides.

Trilobus.—Three-lobed, as in the leaf of Anemone Hepatica.

Trimestris.—Existing for three months.

‡ *Trimus.*—Lasting for three years.

Trinervis.—Having three ribs all proceeding from the base.

Trinodal.—Having three nodes only.

Trioicus.—Having male flowers on one individual, female on another, and hermaphrodite on a third. Its sign is ♂ ⚥ ♀.

Trioperculatus.—Having three lids.

Tripaleolatus.—Consisting of three paleæ, as the flower of a Bamboo.

Triparted.—Parted to the base in three divisions.

Tripetaloid.—Consisting of six parts, of which three resemble petals, and three are green and small.

Triphyllus.—Having its leaves in a whorl of three, or having only three leaves.

Tripinnate, *Triplicato-pinnatus.*—When the leaflets of a bipinnate leaf become themselves pinnate (EB. 120 b).

Triple-ribbed, *Triple-nerved.*—When of three ribs the two lateral ones emerge from the middle one a little above its base. (*ccccxvi.*)

CCCXVI.

‡ *Triplici.*—Thrice repeated.

‡ *Tripliformia folia.*—Leaves resembling the triple-ribbed form.

Triplinervis.—See *Triple-ribbed.*

Triplo.—Thrice.

Tripterus.—Three-winged.

Triqueter.—Three-edged, or cornered.

‡ *Triserialis.*—In three rows. Instead of this word, *fariam* is generally added to the end of a Latin numeral; thus, *trifariam*, in three rows.

Tristichous.—In three rows.

Tristis.—Dull-coloured.

Triternate.—When a common petiole divides into three secondary petioles, which are each subdivided into three tertiary petioles, each bearing three leaflets.

Trochlearis.—See *Pulley-shaped.*

‡ *Trophopollen.*—The partition of the cell of an anther or its remains.

‡ *Trophospermium.*—The placenta.

Tropis.—In Greek compounds = the keel of a papilionaceous flower, or any part resembling it.

Trumpet-shaped.—Hollow, and dilated at one extremity, like the end of a trumpet; as the corolla of Caprifolium sempervirens.

Truncate.—Terminating very abruptly, as if a piece had been cut off; as the leaf of the Tulip tree (EB. 118 c).

Truncus.—The bole or principal stem of a tree.

‡ *Tryma.*—An inferior drupe, with a two-valved separable flesh; as the Walnut.

Tubæformis, Tubatus.—See *Trumpet-shaped.*

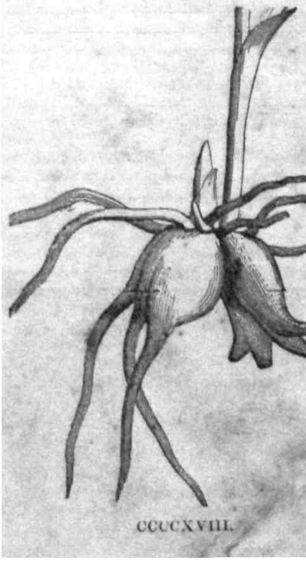
Tube.—The part of a monosepalous calyx, or monopetalous corolla, formed by the union of the edges of the sepals or petals. Also applied to adhesions of stamens.

Tuber.—A roundish under-ground succulent stem, covered with buds, from which new plants or tubers are produced; as the Potato. A receptacle of vegetable food.

Tubercled.—Covered with little excrescences or warts. (*ccccxvii.*)

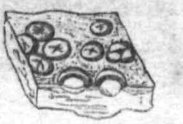
CCCCXVII.

Tubercule.—Simple roots which acquire a succulent condition, become reservoirs of vegetable food, and serve for propagation, in consequence of being terminated by a bud. A little tuber. (*ccccxviii.*)



CCCCXVIII.

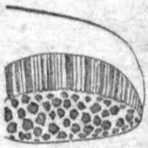
Tuberculum.—A wart-like shield, such as i found in the genus Verrucaria. (*ccccxix.*



CCCCXIX.

‡ Any kind of small wart-like ex crescence.

Tubi, Tubuli.—The pores of certain Fungals. (*ccccxx.*)



CCCCXX.

Also ringed tubes found in the globule of a Chara (VK. 13, 4).

Tubular, Tubulosus, ulatus, atus. — Approaching a cylindrical figure, and hollow.

‡ *Tunica*, (adj. *Tunicatus*).—The skin of a seed. Any loose membranous skin not formed from epidermis.

Tunica.—The peridium of certain Fungals.

Turbinate.—See *Top-shaped.*

Turio.—A scaly sucker, which afterwards becomes a stem; as in Asparagus.

Turned inwards.—See *Introrsus.*

Turned outwards.—See *Extrorsus.*

Turnip-shaped.—See *Napiformis.*

Turpentine vessels.—Tubes formed in the interstices of tissue, into which turpentine, or such secretions, are naturally drained during the growth of a plant. They are common in Conifers.

Twin digitato-pinnate.—When the secondary petioles, on the sides of which the leaflets are arranged, proceed in twos from the summit of a common petiole, as in Mimosa purpurea. *Mirb.*

Tympanum.—A membrane which stretches across the mouth of the spore-case of some Urn-mosses.

Uliginosus, ‡ *Uliginarius.* — Growing in swampy places.

Ulna, (adj. *Ulnaris*).—The average length of a man's arm; about twenty-four inches.

Umbel.—An inflorescence in which the flower expands centripetally and their stalks radiate from a common point (EB. 139 h; SB. 139, &c.) ‡ The pileus of certain Fungals.

Umbellula. — A partial umbel; an umbel formed at the end of one of the rays of a general umbel (SB. 138).

Umber brown.—Nearly the same as deep brown.

Umbilical cord.—A thread by which seeds are sometimes attached to their placenta.

‡ *Umbilicatus.*—The same as *Peltate.*

Umbilicus.—The hilum of a seed; the scar formed by its separation from the placenta. ‡ The ostiolum of certain Fungals.

Umbonatus.—Round, with a projecting point in the centre, like the boss or *umbo* of an ancient shield, as the pileus of many species of Agaricus.

Umbonulatus.—Terminated by a very small boss or nipple.

Umbraculiform, Umbrella-shaped.—Resembling an expanded umbrella; that is to say, hemispherical, with rays or plaits proceeding from a common centre, as the stigma of Sarracenia (EB. 176).

Umbraculum.—A convex body, which in Marchantia terminates the seta, and bears the reproductive bodies on the under side. (*ccccxxi.*) Any similar body.

CCCCXXI.

Umbrinus.—See *Umber brown.*

Umbrosus.—Growing in shady places.

Unarmed.—Having no spines, prickles, or other sharp hard projections. Sometimes, pointless.

Uncatus, Uncinatus, Unciformis.—Hooked. Curved suddenly back at the point.

Unci.—Hooked hairs; any kind of hook.

Uncia (adj. *Uncialis*).—An inch.

Unctuosus.—Having a surface, which, though not actually greasy, feels so.

Undershrub.—A woody plant of small size, the ends of whose branches perish every year. See *Suffrutex.*

Undulatus, ‡ *Undatus.*—Wavy; having an uneven, alternately convex and concave margin or surface.

Undulato-striatus. — Having elevated lines with a wavy direction. (*ccccxxii.*)

CCCCXXII.

Unequally pinnated.—Having a solitary leaflet at the end of a pinnated leaf (EB. 120 h).

Unguiculate.—A term exclusively applied to petals, which have an unguis or stalk.

Unguis.—Half-an-inch, or the length of the nail of the little finger. Also the stalk of a petal.

Uni.—In Latin compounds = one, as; *unialatus*, having one wing; *unicalcaratus*, one spur; *unicapsularis*, one capsule, and so on.

Unicolor.—Uniformly of one and the same colour.

Unicus.—Growing singly.

Unijugatus, Unijugus.—Having one pair of leaflets. See *Conjugatus.*

Unilateralis.—One-sided.

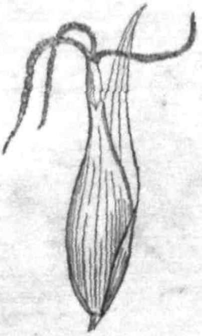
Uninervatus, Uninervis.—One-ribbed.

Uninterrupted.—Consisting of regularly increasing or diminishing parts, or of parts all of the same size. See *Continuous.*

‡ *Uniparous.*—Having but one peduncle.

Ura.—In Greek compounds = tail or tail-like process, or even a tail-like inflorescence.

Urceolus.—The two confluent bracts of Carex. Any flask-shaped or cup-shaped anomalous organ. (*ccccxxiv.*)



CCCCXXIV.

Urceolatus.—The same as *Campanulate*, but more contracted at the orifice, with a small limb. (*ccccxxv.*)

CCCCXXV.

Urceolato-campanulate. — Intermediate between urceolate and campanulate. (*ccccxxvi.*)

CCCCXXVI.